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NASA Technical Paper 1409



# Effect of Casing Treatment on Performance of a Two-Stage High-Pressure-Ratio Fan

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**Scientific and Technical
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## SUMMARY

A high-pressure-ratio (2.4), two-stage fan, which had been tested earlier with a solid casing, was tested with a treated casing (circumferential grooves over both rotors). The tests were conducted at 80 and 100 percent of design speed with uniform weight flow. Radial surveys of the flow conditions at the inlet and behind both stator-blade rows were made over the stable operating flow ranges for those speeds. The results were compared with those of the fan with solid casing. The treated casing significantly improved the flow range without changing the characteristic overall performance curves of total-pressure ratio and efficiency as functions of weight flow, other than extending them to lower weight flows. With the treated casing the stall margin, based on peak efficiency weight flow, increased from 8.5 to 14 percent at design speed and from 15.5 to 25 percent at 80 percent of design speed. Comparisons of radial distributions of performance parameters indicated no significant change in blade-element performance with the treated casing.

## INTRODUCTION

A NASA program is being conducted to investigate the aerodynamic performance of a two-stage, high-pressure-ratio fan designed with spaced blade rows. The results of the testing of this fan (ref. 1) showed that at design stator-blade settings the fan was deficient in weight flow, pressure ratio, and efficiency. However, preliminary performance with stator-blade resets, conducted at part speed, showed an increase in weight flow and pressure ratio along with an increase in efficiency (approximately 3 percentage points). However, before the effect of stator-blade reset could be evaluated at design speed, three vibration dampers on the first-stage rotor failed.

Because of this performance potential, the first-stage rotor was rebuilt to the same aerodynamic design, except that larger vibration dampers were incorporated. Test results of this rebuilt fan (ref. 2) showed that large losses occurred in the region of the damper, decreasing the performance of the first rotor and stage and thereby lowering the overall performance of the fan. They also showed that the overall performance was insensitive to stator-blade reset at design speed.

The present investigation evaluated the performance of the two-stage fan with casing treatment over both rotors. Casing treatment has been successful in improving weight flow range and, in some cases, pressure ratio and efficiency (refs. 3 and 4).

Circumferentially grooved casings were selected because of their potential for improving these parameters as well as their ease of manufacture and low cost.

The performances of the two-stage fan with a treated casing (circumferentially grooved) and with a solid casing (ref. 2) are compared. The data are presented in both tabular and plotted form. The symbols are defined, and the equations are given in appendixes A and B, and the definitions and units used for the tabular data are presented in appendix C.

## TWO-STAGE FAN DESIGN

The design of the two-stage fan is discussed in detail in reference 1. For convenience, all significant blade design parameters are listed in tables I to III. The flow path of the fan is shown in figure 1.

Cross-sectional sketches of the circumferentially grooved casings are shown in figure 2. The grooves, which extend only over the midportion of the blade (approximately 60 percent of blade tip axial chord), minimize rear-to-forward recirculation, but allow blade-to-blade reculation in the circumferential direction. The estimated rotating tip clearance for both rotors was 0.04 centimeter.

## APPARATUS AND PROCEDURE

### Compressor Test Facility

The two-stage fan was tested in the multistage compressor facility, which is described in detail in reference 1. A schematic diagram of the facility is shown in figure 3. Atmospheric air enters the test facility at an inlet located on the roof of the building and flows through the flow measuring orifice, through the inlet butterfly throttle valves, and into the plenum chamber upstream of the test compressor. The air then passes through the test fan into the collector and is then exhausted either to the atmosphere or to an altitude exhaust system. Weight flow is controlled with a sleeve valve in the collector. For this series of tests the large inlet butterfly throttle valve remained fully open with the small valve fully closed, and the air was exhausted to the atmosphere.

### Instrumentation

Radial surveys of the flow conditions were made at the fan inlet and behind the two stator-blade rows (see fig. 1). Total pressure, total temperature, and flow angle were

measured with combination probes (fig. 4). Each probe was positioned with a null-balancing, stream-direction-sensitive control system. The thermocouple was iron-constantan. All pressures were measured with calibrated transducers. Two combination probes were used at the compressor inlet and behind the first-stage stator, and four combination probes were used behind the second-stage stator. The circumferential locations of the probes at each measuring station are shown in figure 5. The probes behind the stators were circumferentially traversed one stator-blade passage clockwise from the nominal values shown. The fan weight flow was determined by means of a calibrated thin-plate orifice. An electronic speed counter, in conjunction with a magnetic pickup, was used to measure rotative speed (rpm).

The estimated errors of the data based on inherent accuracies of the instrumentation and recording system are as follows:

| | |
|---|---|
| Weight flow, kg/sec | ±0.3 |
| Rotative speed, rpm | ±30 |
| Flow angle, deg | ±1 |
| Temperature, K | ±0.6 |
| Total pressure (station 1), $N/cm^2$ | ±0.07 |
| Total pressure (station 2), $N/cm^2$ | ±0.10 |
| Total pressure (station 3), $N/cm^2$ | ±0.17 |

## Test Procedure

The data were taken over a range of weight flow from maximum flow to near stall at equivalent rotative speeds of 80 and 100 percent of design speed. At each selected flow data were recorded at 11 radial positions at each of the three measuring stations. At each radial position the combination probes behind the stators (stations 2 and 3) were circumferentially traversed to 10 equally spaced locations across a stator-blade gap. Values of pressure, temperature, and flow angle were measured at each circumferential position. At the fan inlet (station 1) radial traverses were made to measure pressure, temperature, and flow angle at each radial position.

## Calculation Procedure

Circumferential values. - At each radial position, behind the two stator blade rows, circumferential arrays of total pressure, total temperature, and flow angle were generated across a stator blade gap by arithmetically averaging the measurements from the combination probes at each circumferential position.

Radial values. - At each radial position the arithmetically averaged values making

up the circumferential arrays of total pressure, total temperature, and flow angle across one blade gap were again averaged as follows to obtain the representative value (these values are reported herein): The total-pressure array was energy averaged, the total-temperature array was mass averaged, and the flow-angle array was arithmetically averaged.

Representative radial values of total pressure and total temperature between the rotor- and stator-blade rows (necessary for individual rotor- and stator-performance evaluations) were obtained from the arithmetically averaged circumferential arrays of total pressure and total temperature obtained downstream of the adjoining stator and translated upstream of the stator along design streamlines as follows: At each radial position total temperature was selected as the mass-averaged value of the arithmetically averaged values making up the circumferential array while the highest value of total pressure was selected from the arithmetically averaged values making up the circumferential array.

Data reduction. - Data were reduced using a computer program that calculates the radial distributions of static pressure at each measuring station and the radial distributions of flow angle at stations behind the rotors. Radial distributions of static pressure are calculated within the program from equations of continuity of mass flow and full radial equilibrium, which includes gradients of entropy and enthalpy and utilizes design streamline curvature, slope, and endwall blockage. Inputs to this program include equivalent weight flow, corrected speed, and radial distributions of total pressure and total temperature behind a rotating blade row and equivalent weight flow along with radial distributions of total pressure, total temperature, and flow angle behind a fixed blade row. To obtain overall performance for each rotor and stage, the radial values of total temperature were mass averaged, and the radial values of total pressure were energy averaged.

All data reported herein have been translated to the leading and trailing edges of each blade row by the method presented in reference 4. All pressures and temperatures were corrected to sea-level conditions based on the inlet conditions of the first-stage rotor. Weight flow and rotative speed were corrected to sea-level conditions based on the rotor inlet conditions of each stage.

## RESULTS AND DISCUSSION

The experimental performance of the two-stage fan with casing treatment (circumferential grooves over both rotors) is compared with the performance of the fan with a solid casing. The data are compared in two main sections: The overall performance of the two-stage fan along with the performance of each individual stage and rotor: and radial distributions of several performance parameters for each rotor and stator. The plotted

casing treatment data, along with several parameters not shown in the figures, are presented in tabular form: The overall performance data are presented in tables IV and V, and the blade-element data in tables VI to IX. The definitions and units used in the tables are presented in appendix C. All solid casing data were taken from reference 2.

## Overall Performance

Two-stage fan performance. - A comparison of the overall performance of the two-stage fan with a grooved casing and with a solid casing is presented in figure 6(a), where total-pressure ratio, total-temperature ratio, and adiabatic efficiency are plotted as functions of equivalent weight flow. Casing treatment had no effect on total-pressure ratio, total-temperature ratio, or efficiency. However, its use significantly improved the stall margin at both 80 and 100 percent of design speed. The stall margin at design speed, based on a peak efficiency weight flow of 32.70 kilograms per second, increased from 8.5 percent for the solid casing to 14 percent for the grooved casing. At 80 percent of design speed, the stall margin, based on a peak efficiency weight flow of 25.35 kilograms per second, increased from 15.5 to 25 percent.

First-stage performance. - The overall performance of the first stage and rotor are presented in figures 6(b) and (c), where total-pressure ratio, total-temperature ratio, and adiabatic efficiency are plotted as functions of equivalent weight flow at 80 and 100 percent of design speed. Overall stage performance (fig. 6(b)) shows that the grooved casing did not alter overall pressure ratio and efficiency over the flow range of the solid casing, but did allow the stage to operate to a lower flow rate. A peak efficiency value of 0.776 was obtained at a fan weight flow of 31.9 kilograms per second with both casings.

Overall rotor performance (fig. 7(a)) shows that the grooved casing produced similar results; that is, overall pressure ratio and efficiency performance curves were not altered, but the flow range was extended to a lower flow rate. A peak efficiency value of 0.819 was obtained at a fan weight flow of 31.9 kilograms per second (coincides with the stage peak efficiency weight flow) with both casing configurations.

Nondimensional stage performance. - The nondimensional performances of the stages and rotors are presented in figure 7. Head-rise coefficient, temperature-rise coefficient, and adiabatic efficiency are plotted as functions of stage flow coefficient. The performances are compared at design speed, and the design points are shown on all figures.

First stage: The overall performance of the first stage, at design speed (fig. 7(a)) shows that the grooved casing did not alter the stage head-rise coefficient or adiabatic efficiency over the flow-coefficient range of the solid casing but allowed the stage to operate to a lower flow coefficient. The flow coefficient at stall decreased from 0.425

with the solid casing to 0.403 with the grooved casing. Peak efficiency for the stage, with and without casing treatment, was 0.776; the design value was 0.838. Peak efficiency was obtained at a flow coefficient of 0.430 with both configurations.

The overall performance of the first-stage rotor (fig. 7(b)) shows that the grooved casing exhibits the same results as the stage; that is, the rotor head coefficient and efficiency are not altered, but the flow range is significantly increased. The peak efficiency for the rotor, with and without casing treatment, was 0.807; the design value was 0.886. Peak efficiency was obtained at a flow coefficient of 0.430 (coincides with stage peak efficiency flow coefficient) with both configurations.

Second stage: The overall performance of the second stage (fig. 7(c)) shows that casing treatment did not alter the stage head-rise coefficient and efficiency over the flow coefficient range of the solid casing, but allowed the stage to operate to a lower flow coefficient. The flow coefficient at stall decreased from 0.453 with the solid casing to 0.429 with the grooved casing. At the stage design flow coefficient value of 0.463, the stage exceeded its design head-rise coefficient but remained approximately 4 points below its design efficiency of 0.861.

The overall performance of the second-stage rotor (fig. 9(d)) shows results similar to that of the stage; that is, casing treatment did not alter the rotor head-rise coefficient and efficiency, but allowed the rotor to operate to a lower flow coefficient. Rotor peak efficiency is approximately 3.5 points below its design value of 0.902.

## Radial Distributions

Comparisons of radial distributions of performance parameters for the two casings near fan peak efficiency weight flow (30.60 kg/sec with the grooved casing and 30.66 kg/sec with the solid casing) revealed no significant differences and are not presented herein. The radial distributions of performance parameters for the two configurations at design speed are compared at their respective stall weight flows (30.54 kg/sec with the grooved casing and 31.73 kg/sec with the solid casing). Performance is presented for the four blade rows in figure 8. With each blade row, some small differences are attributed to the differences in weight flow. At the lower stall flow with circumferential grooves, one would expect higher blade loadings (D-factors), higher energy addition, and higher incidence angles across the entire blade span.

## CONCLUDING REMARKS

Casing treatments have been successful on rotors that were considered tip critical (i.e., blade elements in the tip region reach a critical operating condition and stall

before the remaining elements). Casing treatment applied over the tips of such rotors has improved flow range, stall margin, and, in some cases, pressure ratio and efficiency. In addition, in some instances, the efficiency degradation associated with increased rotor clearances has been reduced. For this two-stage fan the blade-element parameter values of meridional velocity, deviation angle, and loss coefficient in the tip regions, did not change rapidly as might be expected if the rotor tip had been critical. Yet, the application of casing treatment significantly increased the flow range and stall margin of the fan at both 80 and 100 percent of design speed. It is conceivable that these effects are confined to the narrow region which is less than 5 percent of span from the rotor tip (outside of our region of measurement).

## SUMMARY OF RESULTS

A two-stage fan was tested earlier with a solid casing and found to be deficient in flow, stall margin, pressure ratio, and efficiency. The fan was retested with casing treatment (circumferential grooves) over the tips of both rotors. Tests were conducted at 80 and 100 percent of design speed. The overall and blade-element performances with and without casing treatment were compared. This investigation yielded the following principal results.

1. Casing treatment extended the operation of the fan to a lower flow rotor but had no effect on the fan overall values of total-pressure ratio, total-temperature ratio, and efficiency over the flow range of the solid casing.

2. Casing treatment increased the stall margin, based on peak efficiency weight flow, from 8.5 to 14 percent at design speed and from 15.5 to 25 percent at 80 percent of design speed.

3. Casing treatment did not significantly affect blade-element performance.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, October 19, 1978,
505-04.

## APPENDIX A

## SYMBOLS

$A_{an}$ annulus area at rotor leading edge, $m^2$

$A_f$ frontal area at rotor leading edge, $m^2$

$C_p$ specific heat at constant pressure, 1004 J/kg · K

D diffusion factor

$i_{mc}$ mean incidence angle, angle between inlet air direction and line tangent to blade mean camber line at leading edge, deg

$i_{ss}$ suction-surface incidence angle, angle between inlet air direction and line tangent to blade suction surface at leading edge, deg

N rotative speed, rpm

P total pressure, $N/cm^2$

p static pressure, $N/cm^2$

r radius, cm

SM stall margin

T total temperature, K

U wheel speed, m/sec

V air velocity, m/sec

W weight flow, kg/sec

Z axial distance referenced from rotor blade hub leading edge, cm

$\alpha_c$ cone angle, deg

$\alpha_s$ slope of streamline, deg

$\beta$ air angle, angle between air velocity and axial direction, deg

$\beta'_c$ relative meridional air angle based on cone angle, arctan ($\tan \beta'_m \cos \alpha_c / \cos \alpha_s$), deg

$\gamma$ ratio of specific heats (1.40)

$\delta$ ratio of rotor inlet total pressure to standard pressure of 10.13 $N/cm^2$

$\delta^o$ deviation angle, angle between exit air direction and tangent to blade mean camber line at trailing edge, deg

$\eta$ efficiency

$\theta$ ratio of rotor-inlet total temperature to standard temperature of 288.2 K

$\kappa_{mc}$ angle between blade mean camber line and meridional plane, deg

$\kappa_{ss}$ angle between blade suction-surface camber line at leading edge and meridional plane, deg

$\sigma$ solidity, ratio of chord to spacing

$\bar{\omega}$ total-loss coefficient

$\bar{\omega}_p$ profile-loss coefficient

$\bar{\omega}_s$ shock-loss coefficient

Subscripts:

ad adiabatic (temperature rise)

id ideal

LE blade leading edge

m meridional direction

mom momentum-rise

p polytropic

ref reference

TE blade trailing edge

z axial direction

$\theta$ tangential direction

1 instrumentation plane upstream of first-stage rotor

2 instrumentation plane between first-stage stator and second-stage rotor

3 instrumentation plane downstream of second-stage stator

Superscript:

' relative to blade

## APPENDIX B

## EQUATIONS

Suction-surface incidence angle:

$$i_{ss} = (\beta'_c)_{LE} - \kappa_{ss} \tag{B1}$$

Mean incidence angle:

$$i_{mc} = (\beta'_c)_{LE} - (\kappa_{mc})_{LE} \tag{B2}$$

Deviation angle:

$$\delta^o = (\beta'_c)_{TE} - (\kappa_{mc})_{TE} \tag{B3}$$

Diffusion factor:

$$D = 1 - \frac{V'_{TE}}{V'_{LE}} + \left| \frac{(rV_\theta)_{TE} - (rV_\theta)_{LE}}{(r_{TE} + r_{LE})\sigma (V'_{LE})} \right| \tag{B4}$$

Total-loss coefficient:

$$\bar{\omega} = \frac{(P'_{id})_{TE} - P'_{TE}}{P'_{LE} - p_{LE}} \tag{B5}$$

Profile-loss coefficient:

$$\bar{\omega}_p = \bar{\omega} - \bar{\omega}_s \tag{B6}$$

Total-loss parameter:

$$\frac{\bar{\omega} \cos (\beta'_m)_{TE}}{2\sigma} \tag{B7}$$

Profile-loss parameter:

$$\frac{\bar{\omega}_p \cos (\beta'_m)_{TE}}{2\sigma} \tag{B8}$$

Adiabatic (temperature rise) efficiency:

$$\eta_{ad} = \frac{\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma} - 1}{\frac{T_{TE}}{T_{LE}} - 1} \tag{B9}$$

Temperature-rise coefficient:

$$\frac{C_p}{U_{tip}^2} (T_{TE} - T_{LE}) \tag{B10}$$

Equivalent weight flow:

$$\frac{W\sqrt{\theta}}{\delta} \tag{B11}$$

Equivalent rotative speed:

$$\frac{N}{\sqrt{\theta}} \tag{B12}$$

Weight flow per unit annulus area:

$$\frac{\frac{W\sqrt{\theta}}{\delta}}{A_{an}} \tag{B13}$$

Weight flow per unit frontal area:

$$\frac{\frac{W\sqrt{\theta}}{\delta}}{A_f} \tag{B14}$$

Head-rise coefficient:

$$\frac{C_p T_{LE}}{U_{tip}^2}\left[\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma} - 1\right] \tag{B15}$$

Flow coefficient:

$$\left(\frac{V_z}{U_{tip}}\right)_{LE} \tag{B16}$$

Stall margin:

$$SM = \left[\frac{\left(\frac{P_{TE}}{P_{LE}}\right)_{stall}}{\left(\frac{P_{TE}}{P_{LE}}\right)_{ref}} \times \frac{\left(\frac{W\sqrt{\theta}}{\delta}\right)_{ref}}{\left(\frac{W\sqrt{\theta}}{\delta}\right)_{stall}} - 1\right] \times 100 \tag{B17}$$

Polytropic efficiency:

$$\eta_p = \frac{\ln\left(\frac{P_{TE}}{P_{LE}}\right)^{(\gamma-1)/\gamma}}{\ln\left(\frac{T_{TE}}{T_{LE}}\right)} \tag{B18}$$

## APPENDIX C

## DEFINITIONS AND UNITS USED IN TABLES

| | |
|---|---|
| ABS | absolute |
| AERO CHORD | aerodynamic chord, cm |
| BETAM | meridional air angle, deg |
| CHOKE MARGIN | ratio of excessive flow area above critical area to critical area |
| CONE ANGLE | angle between axial direction and conical surface representing blade element, deg |
| DELTA INC | difference between mean camber blade angle and suction-surface blade angle at leading edge, deg |
| DEV | deviation angle (defined by eq. (B3)), deg |
| D-FACT | diffusion factor (defined by eq. (B4)) |
| EFF | adiabatic efficiency (defined by eq. (B9)) |
| IN | inlet (leading edge of blade) |
| INCIDENCE | incidence angle (suction surface defined by eq. (B1) and mean surface by eq. (B2)) |
| KIC | angle between blade mean camber line at leading edge and meridional plane, deg |
| KOC | angle between blade mean camber line at trailing edge and meridional plane, deg |
| KTC | angle between blade mean camber line at transition point and meridional plane, deg |
| LOSS COEFF | loss coefficient (total defined by eq. (B5) and profile by eq. (B6)) |
| LOSS PARAM | loss parameter (total defined by eq. (B7) and profile by eq. (B8)) |
| MERID | meridional |
| MERID VEL R | meridional velocity ratio |
| OUT | outlet (trailing edge of blade) |
| PERCENT SPAN | percent of blade span from tip at first-stage rotor outlet |
| PHISS | suction-surface camber ahead of assumed shock location, deg |
| PRESS | pressure, $N/cm^2$ |

| | |
|---|---|
| PROF | profile |
| RADII | radius, cm |
| REL | relative to blade |
| RI | inlet radius (leading edge of blade), cm |
| RO | outlet radius (trailing edge of blade), cm |
| RP | radial position |
| RPM | equivalent rotative speed, rpm |
| SETTING ANGLE | angle between aerodynamic chord and meridional plane, deg |
| SOLIDITY | ratio of aerodynamic chord to blade spacing |
| SPEED | speed, m/sec |
| SS | suction surface |
| STREAMLINE SLOPE | slope of streamline, deg |
| TANG | tangential |
| TEMP | temperature, K |
| TI | thickness of blade at leading edge, cm |
| TM | thickness of blade at maximum thickness, cm |
| TO | thickness of blade at trailing edge, cm |
| TOT | total |
| TOTAL CAMBER | difference between inlet and outlet blade mean camber lines, deg |
| TURNING RATIO | ratio of mean camber line curvatures upstream and downstream of transition point |
| VEL | velocity, m/sec |
| WT FLOW | equivalent weight flow, kg/sec |
| ZI | axial distance from inlet hub to blade leading edge, cm |
| ZMC | axial distance from inlet hub to blade maximum thickness point, cm |
| ZO | axial distance from inlet hub to blade trailing edge, cm |
| ZTC | axial distance from inlet hub to transition point, cm |

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## TABLE I. - DESIGN OVERALL FAN PERFORMANCE

### (a) Two-stage fan

| | |
|---|---|
| TOTAL PRESSURE RATIO | 2.400 |
| TOTAL TEMPERATURE RATIO | 1.335 |
| ADIABATIC EFFICIENCY | 0.846 |
| POLYTROPIC EFFICIENCY | 0.863 |
| RPM (BASED ON FAN INLET) | 16042.8 |
| WT FLOW | 33.248 |

### (b) First stage

| | |
|---|---|
| ROTOR TOTAL PRESSURE RATIO | 1.632 |
| STAGE TOTAL PRESSURE RATIO | 1.591 |
| ROTOR TOTAL TEMPERATURE RATIO | 1.169 |
| STAGE TOTAL TEMPERATURE RATIO | 1.169 |
| ROTOR ADIABATIC EFFICIENCY | 0.886 |
| STAGE ADIABATIC EFFICIENCY | 0.838 |
| ROTOR POLYTROPIC EFFICIENCY | 0.894 |
| STAGE POLYTROPIC EFFICIENCY | 0.848 |
| ROTOR HEAD RISE COEFFICIENT | 0.239 |
| STAGE HEAD RISE COEFFICIENT | 0.226 |
| FLOW COEFFICIENT | 0.453 |
| WT FLOW PER UNIT FRONTAL AREA | 164.041 |
| WT FLOW PER UNIT ANNULUS AREA | 195.287 |
| TIP SPEED | 426.720 |

### (c) Second stage

| | |
|---|---|
| ROTOR TOTAL PRESSURE RATIO | 1.537 |
| STAGE TOTAL PRESSURE RATIO | 1.508 |
| ROTOR TOTAL TEMPERATURE RATIO | 1.144 |
| STAGE TOTAL TEMPERATURE RATIO | 1.144 |
| ROTOR ADIABATIC EFFICIENCY | 0.902 |
| STAGE ADIABATIC EFFICIENCY | 0.861 |
| ROTOR POLYTROPIC EFFICIENCY | 0.908 |
| STAGE POLYTROPIC EFFICIENCY | 0.868 |
| ROTOR HEAD RISE COEFFICIENT | 0.269 |
| STAGE HEAD RISE COEFFICIENT | 0.257 |
| FLOW COEFFICIENT | 0.463 |
| WT FLOW PER UNIT FRONTAL AREA | 181.801 |
| WT FLOW PER UNIT ANNULUS AREA | 260.974 |
| TIP SPEED | 405.341 |

EQUIVALENT VALUES BASED ON STAGE INLET

| | |
|---|---|
| WT FLOW PER UNIT FRONTAL AREA | 123.489 |
| WT FLOW PER UNIT ANNULUS AREA | 177.268 |
| WT FLOW | 22.584 |
| RPM | 14835.823 |
| TIP SPEED | 374.845 |

TABLE II. - DESIGN BLADE-ELEMENT PARAMETERS

(a) First-stage rotor

| | RADII | | ABS BETAM | | REL BETAM | | TOTAL TEMP | | TOTAL PRESS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | RATIO | IN | RATIO |
| TIP | 25.400 | 24.938 | .0 | 41.7 | 68.5 | 62.1 | 288.2 | 1.194 | 10.14 | 1.632 |
| 1 | 24.704 | 24.266 | .0 | 41.8 | 66.9 | 61.2 | 288.2 | 1.189 | 10.14 | 1.632 |
| 2 | 23.977 | 23.594 | .0 | 41.8 | 65.4 | 60.1 | 288.2 | 1.185 | 10.14 | 1.632 |
| 3 | 22.538 | 22.250 | .0 | 41.8 | 63.0 | 57.1 | 288.2 | 1.177 | 10.14 | 1.632 |
| 4 | 21.091 | 20.907 | .0 | 42.1 | 60.7 | 53.7 | 288.2 | 1.170 | 10.14 | 1.632 |
| 5 | 20.219 | 20.101 | .0 | 42.5 | 59.4 | 51.1 | 288.2 | 1.167 | 10.14 | 1.632 |
| 6 | 19.343 | 19.294 | .0 | 43.2 | 58.1 | 48.2 | 288.2 | 1.166 | 10.14 | 1.632 |
| 7 | 18.167 | 18.219 | .0 | 44.3 | 56.4 | 43.5 | 288.2 | 1.164 | 10.14 | 1.632 |
| 8 | 15.134 | 15.532 | .0 | 46.9 | 51.9 | 26.5 | 288.2 | 1.160 | 10.14 | 1.632 |
| 9 | 13.534 | 14.188 | .0 | 48.7 | 49.3 | 14.5 | 288.2 | 1.160 | 10.14 | 1.632 |
| 10 | 11.853 | 12.845 | .0 | 50.2 | 46.5 | .5 | 288.2 | 1.160 | 10.14 | 1.632 |
| 11 | 10.973 | 12.173 | .0 | 50.7 | 44.9 | -6.4 | 288.2 | 1.159 | 10.14 | 1.632 |
| HUB | 10.160 | 11.501 | .0 | 51.1 | 43.3 | -12.8 | 288.2 | 1.158 | 10.14 | 1.632 |

| | ABS VEL | | REL VEL | | MERID VEL | | TANG VEL | | WHEEL SPEED | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | IN | OUT |
| TIP | 168.0 | 201.7 | 458.6 | 322.0 | 168.0 | 153.5 | .0 | 134.3 | 426.7 | 419.0 |
| 1 | 177.1 | 201.5 | 451.3 | 311.8 | 177.1 | 150.2 | .0 | 134.4 | 415.0 | 407.7 |
| 2 | 184.5 | 202.1 | 443.1 | 301.8 | 184.5 | 150.5 | .0 | 134.8 | 402.8 | 396.4 |
| 3 | 192.9 | 205.3 | 424.9 | 282.0 | 192.9 | 153.0 | .0 | 136.9 | 378.6 | 373.8 |
| 4 | 198.6 | 209.2 | 406.2 | 261.9 | 198.6 | 155.2 | .0 | 140.3 | 354.3 | 351.2 |
| 5 | 200.8 | 212.3 | 394.6 | 249.4 | 200.8 | 156.5 | .0 | 143.5 | 339.7 | 337.7 |
| 6 | 202.1 | 216.2 | 382.7 | 236.2 | 202.1 | 157.5 | .0 | 148.1 | 325.0 | 324.1 |
| 7 | 202.8 | 222.2 | 366.5 | 219.4 | 202.8 | 159.2 | .0 | 155.1 | 305.2 | 306.1 |
| 8 | 199.5 | 243.5 | 323.2 | 185.8 | 199.5 | 166.2 | .0 | 177.9 | 254.3 | 260.9 |
| 9 | 195.3 | 258.8 | 299.7 | 176.5 | 195.3 | 170.9 | .0 | 194.3 | 227.4 | 238.4 |
| 10 | 189.1 | 278.9 | 274.6 | 178.4 | 189.1 | 178.4 | .0 | 214.4 | 199.1 | 215.8 |
| 11 | 185.0 | 291.1 | 261.2 | 185.5 | 185.0 | 184.3 | .0 | 225.3 | 184.4 | 204.5 |
| HUB | 181.3 | 303.8 | 249.0 | 195.6 | 181.3 | 190.8 | .0 | 236.4 | 170.7 | 193.2 |

| | ABS MACH NO | | REL MACH NO | | MERID MACH NO | | STREAMLINE SLOPE | | MERID PEAK SS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | VEL R | MACH NO |
| TIP | .506 | .559 | 1.382 | .893 | .506 | .417 | -11.06 | -12.78 | .896 | 1.505 |
| 1 | .535 | .560 | 1.364 | .866 | .535 | .417 | -9.47 | -10.60 | .848 | 1.473 |
| 2 | .559 | .563 | 1.342 | .840 | .559 | .419 | -8.01 | -8.73 | .816 | 1.445 |
| 3 | .586 | .574 | 1.291 | .789 | .586 | .428 | -5.71 | -5.93 | .793 | 1.402 |
| 4 | .605 | .588 | 1.237 | .736 | .605 | .436 | -3.49 | -3.45 | .782 | 1.372 |
| 5 | .612 | .598 | 1.202 | .702 | .612 | .441 | -2.17 | -2.09 | .779 | 1.356 |
| 6 | .616 | .610 | 1.167 | .666 | .616 | .444 | -.86 | -.79 | .779 | 1.344 |
| 7 | .619 | .629 | 1.117 | .621 | .619 | .450 | .90 | .87 | .785 | 1.333 |
| 8 | .608 | .696 | .984 | .531 | .608 | .475 | 5.82 | 5.00 | .833 | 1.344 |
| 9 | .594 | .744 | .912 | .508 | .594 | .491 | 8.91 | 7.17 | .875 | 1.295 |
| 10 | .574 | .810 | .833 | .518 | .574 | .518 | 12.90 | 9.50 | .944 | 1.225 |
| 11 | .561 | .850 | .791 | .542 | .561 | .538 | 15.41 | 10.77 | .996 | 1.176 |
| HUB | .549 | .893 | .753 | .575 | .549 | .561 | 17.84 | 12.07 | 1.052 | 1.129 |

| | PERCENT | INCIDENCE | | DEV | D-FACT | EFF | LOSS COEFF | | LOSS PARAM | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | SPAN | MEAN | SS | | | | TOT | PROF | TOT | PROF |
| TIP | .00 | 2.1 | .0 | 2.8 | .410 | .773 | .177 | .098 | .032 | .018 |
| 1 | 5.00 | 2.3 | .0 | 2.8 | .420 | .794 | .160 | .091 | .029 | .016 |
| 2 | 10.00 | 2.5 | .0 | 2.9 | .429 | .814 | .145 | .084 | .026 | .015 |
| 3 | 20.00 | 3.0 | -.0 | 3.1 | .447 | .849 | .119 | .073 | .022 | .014 |
| 4 | 30.00 | 3.4 | -.0 | 3.4 | .467 | .882 | .096 | .061 | .018 | .012 |
| 5 | 36.00 | 3.6 | -.0 | 3.7 | .481 | .897 | .086 | .056 | .017 | .011 |
| 6 | 42.00 | 3.9 | -.0 | 4.0 | .498 | .905 | .081 | .057 | .016 | .011 |
| 7 | 50.00 | 4.2 | -.0 | 4.5 | .520 | .916 | .076 | .058 | .015 | .012 |
| 8 | 70.00 | 4.9 | .0 | 6.6 | .557 | .936 | .067 | .058 | .014 | .012 |
| 9 | 80.00 | 5.0 | .0 | 7.9 | .552 | .939 | .072 | .070 | .015 | .014 |
| 10 | 90.00 | 4.8 | .0 | 9.1 | .502 | .940 | .081 | .081 | .015 | .015 |
| 11 | 95.00 | 4.6 | .0 | 10.0 | .447 | .944 | .083 | .083 | .014 | .014 |
| HUB | 100.00 | 4.3 | .0 | 11.6 | .376 | .948 | .082 | .082 | .013 | .013 |

TABLE II. - Continued. DESIGN BLADE-ELEMENT PARAMETERS

(b) First-stage stator

| | RADII | | ABS BETAM | | REL BETAM | | TOTAL TEMP | | TOTAL PRESS |
|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | RATIO | IN | RATIO |
| TIP | 24.384 | 24.384 | 38.5 | .0 | 38.5 | .0 | 344.2 | 1.000 | 16.54 | .979 |
| 1 | 23.758 | 23.761 | 38.2 | .0 | 38.2 | .0 | 342.7 | 1.000 | 16.54 | .980 |
| 2 | 23.167 | 23.200 | 37.9 | .0 | 37.9 | .0 | 341.3 | 1.000 | 16.54 | .981 |
| 3 | 21.981 | 22.068 | 37.9 | .0 | 37.9 | .0 | 339.1 | 1.000 | 16.54 | .982 |
| 4 | 20.787 | 20.927 | 38.1 | .0 | 38.1 | .0 | 337.2 | 1.000 | 16.54 | .982 |
| 5 | 20.070 | 20.243 | 38.5 | .0 | 38.5 | .0 | 336.4 | 1.000 | 16.54 | .982 |
| 6 | 19.350 | 19.558 | 39.2 | .0 | 39.2 | .0 | 335.9 | 1.000 | 16.54 | .982 |
| 7 | 18.388 | 18.650 | 40.3 | .0 | 40.3 | .0 | 335.4 | 1.000 | 16.54 | .980 |
| 8 | 15.962 | 16.388 | 43.6 | .0 | 43.6 | .0 | 334.4 | 1.000 | 16.54 | .972 |
| 9 | 14.733 | 15.263 | 45.9 | .0 | 45.9 | .0 | 334.2 | 1.000 | 16.54 | .964 |
| 10 | 13.493 | 14.144 | 48.7 | .0 | 48.7 | .0 | 334.2 | 1.000 | 16.54 | .950 |
| 11 | 12.868 | 13.586 | 50.1 | .0 | 50.1 | .0 | 334.0 | 1.000 | 16.54 | .940 |
| HUB | 12.189 | 12.931 | 51.7 | .0 | 51.7 | .0 | 333.8 | 1.000 | 16.54 | .928 |

| | ABS VEL | | REL VEL | | MERID VEL | | TANG VEL | | WHEEL SPEED | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | IN | OUT |
| TIP | 221.0 | 174.2 | 221.0 | 174.2 | 173.0 | 174.2 | 137.6 | .0 | .0 | .0 |
| 1 | 222.1 | 174.2 | 222.1 | 174.2 | 174.7 | 174.2 | 137.2 | .0 | .0 | .0 |
| 2 | 223.3 | 174.3 | 223.3 | 174.3 | 176.1 | 174.3 | 137.3 | .0 | .0 | .0 |
| 3 | 225.8 | 174.7 | 225.8 | 174.7 | 178.3 | 174.7 | 138.6 | .0 | .0 | .0 |
| 4 | 228.7 | 175.2 | 228.7 | 175.2 | 180.0 | 175.2 | 141.1 | .0 | .0 | .0 |
| 5 | 230.9 | 175.5 | 230.9 | 175.5 | 180.7 | 175.5 | 143.7 | .0 | .0 | .0 |
| 6 | 233.6 | 175.6 | 233.6 | 175.6 | 181.0 | 175.6 | 147.7 | .0 | .0 | .0 |
| 7 | 237.7 | 175.3 | 237.7 | 175.3 | 181.4 | 175.3 | 153.7 | .0 | .0 | .0 |
| 8 | 251.2 | 173.4 | 251.2 | 173.4 | 182.0 | 173.4 | 173.1 | .0 | .0 | .0 |
| 9 | 260.6 | 170.8 | 260.6 | 170.8 | 181.3 | 170.8 | 187.1 | .0 | .0 | .0 |
| 10 | 271.7 | 166.8 | 271.7 | 166.8 | 179.5 | 166.8 | 204.0 | .0 | .0 | .0 |
| 11 | 277.6 | 164.6 | 277.6 | 164.6 | 178.0 | 164.6 | 213.0 | .0 | .0 | .0 |
| HUB | 284.2 | 162.0 | 284.2 | 162.0 | 176.2 | 162.0 | 223.0 | .0 | .0 | .0 |

| | ABS MACH NO | | REL MACH NO | | MERID MACH NO | | STREAMLINE SLOPE | | MERID PEAK SS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | VEL R | MACH NO |
| TIP | .616 | .479 | .616 | .479 | .482 | .479 | -1.22 | .46 | 1.007 | .839 |
| 1 | .621 | .480 | .621 | .480 | .489 | .480 | -.81 | .50 | .997 | .822 |
| 2 | .626 | .481 | .626 | .481 | .494 | .481 | -.45 | .59 | .990 | .811 |
| 3 | .636 | .484 | .636 | .484 | .502 | .484 | .21 | .90 | .980 | .803 |
| 4 | .647 | .487 | .647 | .487 | .509 | .487 | .93 | 1.33 | .973 | .805 |
| 5 | .654 | .489 | .654 | .489 | .512 | .489 | 1.38 | 1.65 | .971 | .811 |
| 6 | .663 | .489 | .663 | .489 | .514 | .489 | 1.85 | 2.01 | .970 | .824 |
| 7 | .677 | .489 | .677 | .489 | .516 | .489 | 2.51 | 2.50 | .966 | .843 |
| 8 | .720 | .484 | .720 | .484 | .522 | .484 | 4.34 | 3.75 | .953 | .910 |
| 9 | .750 | .477 | .750 | .477 | .522 | .477 | 5.37 | 4.25 | .942 | .961 |
| 10 | .786 | .465 | .786 | .465 | .519 | .465 | 6.43 | 4.42 | .929 | 1.027 |
| 11 | .805 | .459 | .805 | .459 | .516 | .459 | 6.97 | 4.30 | .925 | 1.064 |
| HUB | .828 | .451 | .828 | .451 | .513 | .451 | 7.54 | 4.13 | .919 | 1.106 |

| | PERCENT | INCIDENCE | | DEV | D-FACT | EFF | LOSS COEFF | | LOSS PARAM | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | SPAN | MEAN | SS | | | | TOT | PROF | TOT | PROF |
| TIP | .00 | 3.0 | -3.0 | 17.0 | .457 | .000 | .094 | .094 | .037 | .037 |
| 1 | 5.00 | 3.0 | -3.0 | 13.9 | .453 | .000 | .086 | .086 | .033 | .033 |
| 2 | 10.00 | 3.0 | -3.0 | 11.9 | .449 | .000 | .082 | .082 | .031 | .031 |
| 3 | 20.00 | 2.9 | -3.0 | 10.0 | .444 | .000 | .077 | .077 | .027 | .027 |
| 4 | 30.00 | 2.8 | -3.0 | 9.3 | .441 | .000 | .073 | .073 | .025 | .025 |
| 5 | 36.00 | 2.8 | -3.0 | 9.0 | .442 | .000 | .072 | .072 | .023 | .023 |
| 6 | 42.00 | 2.7 | -3.0 | 8.8 | .446 | .000 | .072 | .072 | .023 | .023 |
| 7 | 50.00 | 2.7 | -3.0 | 8.6 | .454 | .000 | .077 | .077 | .023 | .023 |
| 8 | 70.00 | 2.5 | -3.0 | 9.0 | .486 | .000 | .095 | .095 | .025 | .025 |
| 9 | 80.00 | 2.3 | -3.0 | 9.7 | .514 | .000 | .115 | .115 | .028 | .028 |
| 10 | 90.00 | 2.2 | -3.0 | 11.7 | .549 | .000 | .150 | .150 | .033 | .033 |
| 11 | 95.00 | 2.0 | -3.0 | 13.2 | .565 | .000 | .173 | .173 | .037 | .037 |
| HUB | 100.00 | 1.9 | -3.0 | 15.0 | .583 | .000 | .198 | .198 | .040 | .040 |

TABLE II. - Continued. DESIGN BLADE-ELEMENT PARAMETERS

(c) Second-stage rotor

| | RADII | | ABS BETAM | | REL BETAM | | TOTAL TEMP | | TOTAL PRESS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | RATIO | IN | RATIO |
| TIP | 24.127 | 23.719 | .0 | 39.2 | 65.5 | 57.3 | 344.3 | 1.157 | 16.20 | 1.530 |
| 1 | 23.533 | 23.187 | .0 | 39.5 | 64.4 | 56.8 | 342.7 | 1.154 | 16.21 | 1.529 |
| 2 | 23.002 | 22.707 | .0 | 39.8 | 63.5 | 56.2 | 341.3 | 1.151 | 16.22 | 1.528 |
| 3 | 21.951 | 21.741 | .0 | 40.0 | 62.1 | 54.3 | 339.1 | 1.147 | 16.24 | 1.527 |
| 4 | 20.900 | 20.779 | .0 | 40.3 | 60.7 | 52.1 | 337.2 | 1.143 | 16.24 | 1.526 |
| 5 | 20.272 | 20.206 | .0 | 40.7 | 60.0 | 50.5 | 336.4 | 1.141 | 16.24 | 1.527 |
| 6 | 19.646 | 19.636 | .0 | 41.3 | 59.2 | 48.6 | 335.9 | 1.140 | 16.23 | 1.527 |
| 7 | 18.813 | 18.888 | .0 | 42.1 | 58.3 | 45.7 | 335.4 | 1.139 | 16.20 | 1.530 |
| 8 | 16.721 | 17.072 | .0 | 44.6 | 56.5 | 36.4 | 334.4 | 1.140 | 16.08 | 1.542 |
| 9 | 15.652 | 16.198 | .0 | 46.6 | 56.1 | 30.0 | 334.2 | 1.142 | 15.94 | 1.555 |
| 10 | 14.537 | 15.351 | .0 | 49.3 | 56.7 | 21.6 | 334.2 | 1.147 | 15.71 | 1.578 |
| 11 | 13.951 | 14.938 | .0 | 50.7 | 57.7 | 16.5 | 334.0 | 1.150 | 15.55 | 1.594 |
| HUB | 13.289 | 14.455 | .0 | 52.4 | 59.2 | 10.1 | 333.8 | 1.154 | 15.36 | 1.614 |

| | ABS VEL | | REL VEL | | MERID VEL | | TANG VEL | | WHEEL SPEED | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | IN | OUT |
| TIP | 185.0 | 216.9 | 445.6 | 310.7 | 185.0 | 168.0 | .0 | 137.1 | 405.3 | 398.5 |
| 1 | 189.4 | 214.6 | 438.4 | 302.3 | 189.4 | 165.5 | .0 | 136.6 | 395.3 | 389.5 |
| 2 | 192.3 | 213.4 | 431.7 | 294.9 | 192.3 | 164.0 | .0 | 136.4 | 386.4 | 381.5 |
| 3 | 195.2 | 213.5 | 417.3 | 280.5 | 195.2 | 163.5 | .0 | 137.3 | 368.8 | 365.3 |
| 4 | 196.7 | 214.6 | 402.5 | 266.3 | 196.7 | 163.6 | .0 | 138.9 | 351.1 | 349.1 |
| 5 | 197.0 | 216.1 | 393.4 | 257.4 | 197.0 | 163.8 | .0 | 140.9 | 340.6 | 339.5 |
| 6 | 196.6 | 218.2 | 384.2 | 247.9 | 196.6 | 164.0 | .0 | 144.0 | 330.1 | 329.9 |
| 7 | 195.2 | 221.6 | 371.4 | 235.6 | 195.2 | 164.4 | .0 | 148.6 | 316.1 | 317.3 |
| 8 | 186.0 | 233.8 | 336.9 | 206.9 | 186.0 | 166.6 | .0 | 164.1 | 280.9 | 286.8 |
| 9 | 176.6 | 242.3 | 316.7 | 192.2 | 176.6 | 166.4 | .0 | 176.0 | 262.9 | 272.1 |
| 10 | 160.2 | 253.7 | 292.1 | 178.0 | 160.2 | 165.5 | .0 | 192.4 | 244.2 | 257.9 |
| 11 | 147.9 | 260.9 | 277.2 | 172.2 | 147.9 | 165.1 | .0 | 202.0 | 234.4 | 251.0 |
| HUB | 133.2 | 269.7 | 260.0 | 167.3 | 133.2 | 164.8 | .0 | 213.6 | 223.3 | 242.8 |

| | ABS MACH NO | | REL MACH NO | | MERID MACH NO | | STREAMLINE SLOPE | | MERID PEAK SS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | VEL R | MACH NO |
| TIP | .511 | .559 | 1.230 | .801 | .511 | .433 | -8.36 | -6.25 | .908 | 1.414 |
| 1 | .525 | .555 | 1.214 | .782 | .525 | .428 | -6.98 | -5.15 | .874 | 1.386 |
| 2 | .534 | .554 | 1.199 | .765 | .534 | .426 | -5.85 | -4.24 | .853 | 1.366 |
| 3 | .545 | .557 | 1.164 | .732 | .545 | .427 | -3.92 | -2.71 | .837 | 1.343 |
| 4 | .551 | .563 | 1.127 | .699 | .551 | .429 | -2.14 | -1.24 | .832 | 1.324 |
| 5 | .552 | .568 | 1.103 | .677 | .552 | .431 | -1.12 | -.38 | .832 | 1.314 |
| 6 | .552 | .575 | 1.078 | .653 | .552 | .432 | -.11 | .47 | .834 | 1.304 |
| 7 | .548 | .585 | 1.042 | .622 | .548 | .434 | 1.22 | 1.62 | .843 | 1.298 |
| 8 | .521 | .620 | .944 | .549 | .521 | .442 | 4.72 | 4.68 | .896 | 1.260 |
| 9 | .494 | .644 | .886 | .511 | .494 | .443 | 6.62 | 6.36 | .943 | 1.222 |
| 10 | .446 | .676 | .813 | .474 | .446 | .441 | 8.58 | 8.20 | 1.033 | 1.184 |
| 11 | .411 | .696 | .770 | .459 | .411 | .440 | 9.57 | 9.21 | 1.116 | 1.165 |
| HUB | .369 | .721 | .720 | .447 | .369 | .440 | 10.69 | 10.40 | 1.237 | 1.143 |

| | PERCENT | INCIDENCE | | DEV | D-FACT | EFF | LOSS COEFF | | LOSS PARAM | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | SPAN | MEAN | SS | | | | TOT | PROF | TOT | PROF |
| TIP | .00 | 2.5 | -.0 | 2.4 | .421 | .819 | .136 | .095 | .028 | .020 |
| 1 | 5.00 | 2.5 | -.0 | 2.5 | .427 | .835 | .124 | .089 | .026 | .019 |
| 2 | 10.00 | 2.5 | -.0 | 2.6 | .433 | .849 | .114 | .084 | .024 | .017 |
| 3 | 20.00 | 2.7 | -.0 | 3.0 | .444 | .873 | .097 | .074 | .020 | .015 |
| 4 | 30.00 | 3.1 | -.0 | 3.4 | .455 | .897 | .081 | .063 | .017 | .013 |
| 5 | 36.00 | 3.4 | -.0 | 3.7 | .463 | .907 | .074 | .059 | .016 | .012 |
| 6 | 42.00 | 3.7 | -.0 | 4.0 | .474 | .913 | .071 | .059 | .015 | .012 |
| 7 | 50.00 | 4.2 | -.0 | 4.6 | .488 | .923 | .066 | .057 | .014 | .012 |
| 8 | 70.00 | 5.2 | -.0 | 6.4 | .520 | .939 | .060 | .058 | .013 | .013 |
| 9 | 80.00 | 5.4 | -.0 | 7.8 | .539 | .942 | .065 | .064 | .014 | .014 |
| 10 | 90.00 | 5.2 | -.0 | 9.9 | .553 | .942 | .076 | .076 | .017 | .017 |
| 11 | 95.00 | 4.9 | -.0 | 11.3 | .553 | .944 | .082 | .082 | .018 | .018 |
| HUB | 100.00 | 4.7 | .1 | 12.8 | .545 | .945 | .091 | .091 | .020 | .020 |

TABLE II. - Concluded. DESIGN BLADE-ELEMENT PARAMETERS

(d) Second-stage stator

| | RADII | | ABS BETAM | | REL BETAM | | TOTAL TEMP | | TOTAL PRESS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | RATIO | IN | RATIO |
| TIP | 23.622 | 23.622 | 39.2 | .0 | 39.2 | .0 | 398.4 | 1.000 | 24.79 | .983 |
| 1 | 23.108 | 23.129 | 38.8 | .0 | 38.8 | .0 | 395.4 | 1.000 | 24.79 | .984 |
| 2 | 22.646 | 22.686 | 38.5 | .0 | 38.5 | .0 | 392.9 | 1.000 | 24.79 | .984 |
| 3 | 21.728 | 21.802 | 38.2 | .0 | 38.2 | .0 | 388.8 | 1.000 | 24.79 | .985 |
| 4 | 20.924 | 20.923 | 38.1 | .0 | 38.1 | .0 | 385.3 | 1.000 | 24.79 | .986 |
| 5 | 20.287 | 20.400 | 38.3 | .0 | 38.3 | .0 | 383.8 | 1.000 | 24.79 | .985 |
| 6 | 19.757 | 19.884 | 38.8 | .0 | 38.8 | .0 | 383.0 | 1.000 | 24.79 | .985 |
| 7 | 19.060 | 19.204 | 39.5 | .0 | 39.5 | .0 | 382.2 | 1.000 | 24.79 | .984 |
| 8 | 17.367 | 17.566 | 42.1 | .0 | 42.1 | .0 | 381.0 | 1.000 | 24.79 | .979 |
| 9 | 16.547 | 16.786 | 44.5 | .0 | 44.5 | .0 | 381.7 | 1.000 | 24.79 | .975 |
| 10 | 15.739 | 16.040 | 48.0 | .0 | 48.0 | .0 | 383.3 | 1.000 | 24.79 | .967 |
| 11 | 15.338 | 15.682 | 50.3 | .0 | 50.3 | .0 | 384.2 | 1.000 | 24.79 | .963 |
| HUB | 14.869 | 15.237 | 52.9 | .0 | 52.9 | .0 | 385.3 | 1.000 | 24.79 | .958 |

| | ABS VEL | | REL VEL | | MERID VEL | | TANG VEL | | WHEEL SPEED | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | IN | OUT |
| TIP | 217.8 | 170.2 | 217.8 | 170.2 | 168.0 | 170.2 | 137.7 | .0 | .0 | .0 |
| 1 | 218.8 | 170.3 | 218.8 | 170.3 | 170.6 | 170.3 | 137.0 | .0 | .0 | .0 |
| 2 | 219.8 | 170.3 | 219.8 | 170.3 | 172.0 | 170.3 | 136.8 | .0 | .0 | .0 |
| 3 | 222.1 | 170.3 | 222.1 | 170.3 | 174.5 | 170.3 | 137.4 | .0 | .0 | .0 |
| 4 | 224.5 | 170.3 | 224.5 | 170.3 | 176.6 | 170.3 | 138.6 | .0 | .0 | .0 |
| 5 | 226.3 | 170.3 | 226.3 | 170.3 | 177.5 | 170.3 | 140.4 | .0 | .0 | .0 |
| 6 | 228.4 | 170.3 | 228.4 | 170.3 | 178.0 | 170.3 | 143.1 | .0 | .0 | .0 |
| 7 | 231.4 | 170.1 | 231.4 | 170.1 | 178.5 | 170.1 | 147.3 | .0 | .0 | .0 |
| 8 | 240.3 | 169.5 | 240.3 | 169.5 | 178.2 | 169.5 | 161.3 | .0 | .0 | .0 |
| 9 | 245.9 | 168.5 | 245.9 | 168.5 | 175.5 | 168.5 | 172.3 | .0 | .0 | .0 |
| 10 | 252.3 | 167.5 | 252.3 | 167.5 | 168.8 | 167.5 | 187.6 | .0 | .0 | .0 |
| 11 | 255.7 | 167.5 | 255.7 | 167.5 | 163.4 | 167.5 | 196.7 | .0 | .0 | .0 |
| HUB | 260.2 | 167.4 | 260.2 | 167.4 | 156.8 | 167.4 | 207.7 | .0 | .0 | .0 |

| | ABS MACH NO | | REL MACH NO | | MERID MACH NO | | STREAMLINE SLOPE | | MERID PEAK SS | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | IN | OUT | IN | OUT | IN | OUT | IN | OUT | VEL R | MACH NO |
| TIP | .562 | .434 | .562 | .434 | .435 | .434 | -.10 | -.03 | 1.008 | .787 |
| 1 | .567 | .435 | .567 | .435 | .442 | .435 | .19 | .18 | .998 | .775 |
| 2 | .571 | .437 | .571 | .437 | .447 | .437 | .44 | .35 | .990 | .767 |
| 3 | .581 | .439 | .581 | .439 | .457 | .439 | .88 | .65 | .975 | .759 |
| 4 | .591 | .441 | .591 | .441 | .465 | .441 | 1.32 | .90 | .964 | .758 |
| 5 | .597 | .442 | .597 | .442 | .468 | .442 | 1.58 | 1.01 | .959 | .763 |
| 6 | .603 | .443 | .603 | .443 | .470 | .443 | 1.86 | 1.11 | .956 | .773 |
| 7 | .613 | .443 | .613 | .443 | .473 | .443 | 2.23 | 1.24 | .953 | .787 |
| 8 | .639 | .442 | .639 | .442 | .474 | .442 | 3.23 | 1.45 | .951 | .838 |
| 9 | .655 | .439 | .655 | .439 | .467 | .439 | 3.81 | 1.53 | .960 | .884 |
| 10 | .672 | .435 | .672 | .435 | .449 | .435 | 4.55 | 1.55 | .993 | .954 |
| 11 | .681 | .435 | .681 | .435 | .435 | .435 | 5.01 | 1.52 | 1.025 | .999 |
| HUB | .693 | .434 | .693 | .434 | .417 | .434 | 5.57 | 1.49 | 1.068 | 1.056 |

| | PERCENT | INCIDENCE | | DEV | D-FACT | EFF | LOSS COEFF | | LOSS PARAM | |
|---|---|---|---|---|---|---|---|---|---|---|
| RP | SPAN | MEAN | SS | | | | TOT | PROF | TOT | PROF |
| TIP | .00 | 2.8 | -3.0 | 16.2 | .471 | .000 | .086 | .086 | .034 | .034 |
| 1 | 5.00 | 2.7 | -3.0 | 14.0 | .466 | .000 | .083 | .083 | .032 | .032 |
| 2 | 10.00 | 2.7 | -3.0 | 12.4 | .463 | .000 | .080 | .080 | .031 | .031 |
| 3 | 20.00 | 2.7 | -3.0 | 10.4 | .461 | .000 | .073 | .073 | .027 | .027 |
| 4 | 30.00 | 2.6 | -3.0 | 9.5 | .459 | .000 | .069 | .069 | .024 | .024 |
| 5 | 36.00 | 2.6 | -3.0 | 9.3 | .460 | .000 | .068 | .068 | .023 | .023 |
| 6 | 42.00 | 2.6 | -3.0 | 9.2 | .464 | .000 | .069 | .069 | .023 | .023 |
| 7 | 50.00 | 2.5 | -3.0 | 9.1 | .470 | .000 | .072 | .072 | .023 | .023 |
| 8 | 70.00 | 2.3 | -3.0 | 9.5 | .492 | .000 | .086 | .086 | .025 | .025 |
| 9 | 80.00 | 2.3 | -3.0 | 10.5 | .511 | .000 | .102 | .102 | .029 | .029 |
| 10 | 90.00 | 2.1 | -3.0 | 12.8 | .533 | .000 | .125 | .125 | .034 | .034 |
| 11 | 95.00 | 2.1 | -3.0 | 14.7 | .544 | .000 | .138 | .138 | .036 | .036 |
| HUB | 100.00 | 1.9 | -3.0 | 17.2 | .557 | .000 | .156 | .156 | .039 | .039 |

TABLE III. - BLADE GEOMETRY

(a) First-stage rotor

| RP | PERCENT SPAN | RADII RI | RADII RO | BLADE ANGLES KIC | BLADE ANGLES KTC | BLADE ANGLES KOC | DELTA INC | CONE ANGLE |
|---|---|---|---|---|---|---|---|---|
| TIP | 0. | 25.400 | 24.938 | 66.34 | 63.45 | 59.36 | 2.04 | -12.624 |
| 1 | 5. | 24.704 | 24.266 | 64.50 | 61.99 | 58.37 | 2.23 | -11.279 |
| 2 | 10. | 23.977 | 23.594 | 62.80 | 60.43 | 57.16 | 2.46 | -9.342 |
| 3 | 20. | 22.538 | 22.250 | 60.02 | 57.21 | 54.03 | 3.01 | -6.371 |
| 4 | 30. | 21.091 | 20.907 | 57.33 | 53.66 | 50.21 | 3.40 | -3.741 |
| 5 | 36. | 20.219 | 20.101 | 55.77 | 51.46 | 47.46 | 3.64 | -2.288 |
| 6 | 42. | 19.343 | 19.294 | 54.23 | 49.15 | 44.18 | 3.89 | -.891 |
| 7 | 50. | 18.167 | 18.219 | 52.18 | 45.94 | 39.01 | 4.21 | .898 |
| 8 | 70. | 15.134 | 15.532 | 46.99 | 36.89 | 19.96 | 4.88 | 5.684 |
| 9 | 80. | 13.534 | 14.188 | 44.35 | 31.92 | 6.51 | 4.98 | 8.621 |
| 10 | 90. | 11.853 | 12.845 | 41.73 | 27.08 | -8.65 | 4.78 | 12.240 |
| 11 | 95. | 10.973 | 12.173 | 40.46 | 24.92 | -16.35 | 4.53 | 14.460 |
| HUB | 100. | 10.160 | 11.501 | 39.30 | 23.02 | -24.12 | 4.27 | 15.866 |

| RP | BLADE THICKNESSES TI | BLADE THICKNESSES TM | BLADE THICKNESSES TO | AXIAL DIMENSIONS ZI | AXIAL DIMENSIONS ZMC | AXIAL DIMENSIONS ZTC | AXIAL DIMENSIONS ZO |
|---|---|---|---|---|---|---|---|
| TIP | .047 | .136 | .047 | 1.337 | 2.318 | 2.722 | 3.401 |
| 1 | .052 | .148 | .051 | 1.268 | 2.320 | 2.688 | 3.466 |
| 2 | .056 | .161 | .056 | 1.202 | 2.322 | 2.647 | 3.531 |
| 3 | .065 | .187 | .066 | 1.088 | 2.324 | 2.544 | 3.659 |
| 4 | .074 | .212 | .076 | .973 | 2.325 | 2.412 | 3.795 |
| 5 | .079 | .228 | .081 | .903 | 2.325 | 2.319 | 3.879 |
| 6 | .085 | .244 | .087 | .832 | 2.324 | 2.215 | 3.969 |
| 7 | .093 | .265 | .095 | .732 | 2.320 | 2.057 | 4.094 |
| 8 | .113 | .320 | .115 | .439 | 2.293 | 1.555 | 4.437 |
| 9 | .124 | .350 | .126 | .273 | 2.287 | 1.254 | 4.589 |
| 10 | .136 | .385 | .137 | .117 | 2.285 | .952 | 4.687 |
| 11 | .143 | .405 | .143 | .054 | 2.293 | .816 | 4.706 |
| HUB | .149 | .423 | .150 | .000 | 2.301 | .696 | 4.719 |

| RP | AERO CHORD | SETTING ANGLE | TOTAL CAMBER | TURNING SOLIDITY | TURNING RATIO | PHISS | CHOKE MARGIN |
|---|---|---|---|---|---|---|---|
| TIP | 4.739 | 63.84 | 6.97 | 1.288 | .298 | 3.56 | .040 |
| 1 | 4.752 | 62.23 | 6.13 | 1.328 | .338 | 3.13 | .040 |
| 2 | 4.750 | 60.60 | 5.64 | 1.367 | .403 | 2.92 | .040 |
| 3 | 4.743 | 57.38 | 5.99 | 1.450 | .621 | 3.16 | .040 |
| 4 | 4.739 | 53.84 | 7.12 | 1.544 | .935 | 3.72 | .040 |
| 5 | 4.737 | 51.54 | 8.31 | 1.608 | 1.088 | 4.13 | .040 |
| 6 | 4.736 | 49.01 | 10.05 | 1.678 | 1.178 | 4.63 | .040 |
| 7 | 4.736 | 45.26 | 13.17 | 1.782 | 1.251 | 5.39 | .040 |
| 8 | 4.748 | 32.63 | 27.03 | 2.119 | 1.356 | 7.99 | .040 |
| 9 | 4.770 | 24.11 | 37.84 | 2.355 | 1.467 | 9.56 | .040 |
| 10 | 4.826 | 14.51 | 50.38 | 2.674 | 1.660 | 10.99 | .040 |
| 11 | 4.871 | 9.66 | 56.81 | 2.881 | 1.786 | 11.47 | .040 |
| HUB | 4.923 | 4.85 | 63.42 | 3.111 | 1.909 | 11.85 | .040 |

(b) First-stage stator

| RP | PERCENT SPAN | RADII RI | RADII RO | BLADE ANGLES KIC | BLADE ANGLES KTC | BLADE ANGLES KOC | DELTA INC | CONE ANGLE |
|---|---|---|---|---|---|---|---|---|
| TIP | 0. | 24.384 | 24.384 | 35.53 | 18.39 | -16.99 | 5.96 | .057 |
| 1 | 5. | 23.758 | 23.761 | 35.19 | 19.29 | -13.93 | 5.96 | .057 |
| 2 | 10. | 23.167 | 23.200 | 34.98 | 20.01 | -11.87 | 5.96 | .331 |
| 3 | 20. | 21.981 | 22.068 | 34.96 | 21.01 | -10.04 | 5.91 | .884 |
| 4 | 30. | 20.787 | 20.927 | 35.24 | 21.89 | -9.30 | 5.84 | 1.434 |
| 5 | 36. | 20.070 | 20.243 | 35.69 | 22.52 | -8.97 | 5.80 | 1.778 |
| 6 | 42. | 19.350 | 19.558 | 36.45 | 23.26 | -8.80 | 5.75 | 2.141 |
| 7 | 50. | 18.388 | 18.650 | 37.60 | 24.34 | -8.62 | 5.67 | 2.702 |
| 8 | 70. | 15.962 | 16.388 | 41.11 | 27.43 | -8.96 | 5.45 | 4.427 |
| 9 | 80. | 14.733 | 15.263 | 43.56 | 29.39 | -9.73 | 5.32 | 5.527 |
| 10 | 90. | 13.493 | 14.144 | 46.49 | 31.56 | -11.65 | 5.14 | 6.797 |
| 11 | 95. | 12.868 | 13.586 | 48.04 | 32.67 | -13.16 | 5.03 | 7.501 |
| HUB | 100. | 12.189 | 12.931 | 49.76 | 33.90 | -15.03 | 4.89 | 7.754 |

| RP | BLADE THICKNESSES TI | BLADE THICKNESSES TM | BLADE THICKNESSES TO | AXIAL DIMENSIONS ZI | AXIAL DIMENSIONS ZMC | AXIAL DIMENSIONS ZTC | AXIAL DIMENSIONS ZO |
|---|---|---|---|---|---|---|---|
| TIP | .150 | .460 | .150 | 10.457 | 13.179 | 12.211 | 16.112 |
| 1 | .146 | .454 | .146 | 10.474 | 13.178 | 12.198 | 16.106 |
| 2 | .141 | .448 | .141 | 10.486 | 13.177 | 12.181 | 16.101 |
| 3 | .131 | .436 | .131 | 10.497 | 13.175 | 12.131 | 16.094 |
| 4 | .122 | .425 | .121 | 10.507 | 13.176 | 12.079 | 16.092 |
| 5 | .117 | .418 | .115 | 10.515 | 13.175 | 12.054 | 16.091 |
| 6 | .111 | .411 | .110 | 10.524 | 13.172 | 12.034 | 16.089 |
| 7 | .103 | .402 | .102 | 10.541 | 13.171 | 12.011 | 16.089 |
| 8 | .085 | .379 | .084 | 10.564 | 13.161 | 11.938 | 16.087 |
| 9 | .075 | .367 | .074 | 10.613 | 13.156 | 11.899 | 16.088 |
| 10 | .066 | .355 | .065 | 10.639 | 13.146 | 11.846 | 16.094 |
| 11 | .061 | .350 | .060 | 10.647 | 13.140 | 11.810 | 16.098 |
| HUB | .055 | .344 | .055 | 10.656 | 13.132 | 11.768 | 16.103 |

| RP | AERO CHORD | SETTING ANGLE | TOTAL CAMBER | TURNING SOLIDITY | TURNING RATIO | PHISS | CHOKE MARGIN |
|---|---|---|---|---|---|---|---|
| TIP | 5.729 | 9.29 | 52.52 | 1.271 | 1.000 | 10.86 | .224 |
| 1 | 5.728 | 10.63 | 49.12 | 1.305 | 1.000 | 9.79 | .210 |
| 2 | 5.729 | 11.56 | 46.85 | 1.337 | 1.000 | 9.02 | .199 |
| 3 | 5.729 | 12.47 | 45.00 | 1.408 | 1.000 | 8.17 | .182 |
| 4 | 5.730 | 12.99 | 44.55 | 1.487 | 1.000 | 7.69 | .168 |
| 5 | 5.731 | 13.39 | 44.66 | 1.539 | 1.000 | 7.57 | .161 |
| 6 | 5.732 | 13.86 | 45.25 | 1.594 | 1.000 | 7.64 | .154 |
| 7 | 5.734 | 14.54 | 46.22 | 1.676 | 1.000 | 7.74 | .145 |
| 8 | 5.743 | 16.18 | 50.07 | 1.921 | 1.000 | 8.19 | .121 |
| 9 | 5.751 | 17.07 | 53.29 | 2.075 | 1.000 | 8.64 | .112 |
| 10 | 5.762 | 17.65 | 58.14 | 2.256 | 1.000 | 9.33 | .106 |
| 11 | 5.769 | 17.73 | 61.20 | 2.360 | 1.000 | 9.72 | .106 |
| HUB | 5.768 | 17.70 | 64.79 | 2.485 | 1.000 | 10.16 | .106 |

TABLE III. - Concluded. BLADE GEOMETRY

(c) Second-stage rotor

| RP | PERCENT SPAN | RADII RI | RADII RO | BLADE ANGLES KIC | BLADE ANGLES KTC | BLADE ANGLES KOC | DELTA INC | CONE ANGLE |
|---|---|---|---|---|---|---|---|---|
| TIP | 0. | 24.127 | 23.719 | 62.90 | 58.37 | 54.69 | 2.57 | -8.911 |
| 1 | 5. | 23.533 | 23.187 | 61.90 | 57.70 | 54.18 | 2.50 | -7.354 |
| 2 | 10. | 23.002 | 22.707 | 61.04 | 56.96 | 53.48 | 2.50 | -6.131 |
| 3 | 20. | 21.951 | 21.741 | 59.42 | 55.00 | 51.31 | 2.69 | -4.123 |
| 4 | 30. | 20.900 | 20.779 | 57.67 | 52.82 | 48.70 | 3.07 | -2.246 |
| 5 | 36. | 20.272 | 20.206 | 56.59 | 51.42 | 46.79 | 3.37 | -1.186 |
| 6 | 42. | 19.646 | 19.636 | 55.52 | 50.00 | 44.57 | 3.70 | -.183 |
| 7 | 50. | 18.813 | 18.888 | 54.14 | 48.02 | 41.14 | 4.17 | 1.246 |
| 8 | 70. | 16.721 | 17.072 | 51.30 | 42.93 | 29.92 | 5.19 | 5.162 |
| 9 | 80. | 15.65? | 16.198 | 50.65 | 40.51 | 22.09 | 5.41 | 7.585 |
| 10 | 90. | 14.52? | 15.351 | 51.37 | 38.55 | 11.58 | 5.23 | 10.660 |
| 11 | 95. | 13.951 | 14.938 | 52.58 | 37.90 | 5.04 | 4.95 | 12.566 |
| HUB | 100. | 13.289 | 14.455 | 54.11 | 37.26 | -2.85 | 4.58 | 14.381 |

| RP | BLADE THICKNESSES TI | BLADE THICKNESSES TM | BLADE THICKNESSES TO | AXIAL DIMENSIONS ZI | AXIAL DIMENSIONS ZMC | AXIAL DIMENSIONS ZTC | AXIAL DIMENSIONS ZO |
|---|---|---|---|---|---|---|---|
| TIP | .060 | .173 | .060 | 22.053 | 23.285 | 23.731 | 24.661 |
| 1 | .065 | .175 | .066 | 22.019 | 23.291 | 23.694 | 24.699 |
| 2 | .070 | .179 | .071 | 21.987 | 23.295 | 23.657 | 24.737 |
| 3 | .079 | .196 | .080 | 21.917 | 23.300 | 23.571 | 24.826 |
| 4 | .089 | .222 | .090 | 21.836 | 23.299 | 23.462 | 24.919 |
| 5 | .094 | .241 | .096 | 21.786 | 23.299 | 23.390 | 24.980 |
| 6 | .100 | .261 | .102 | 21.736 | 23.299 | 23.312 | 25.044 |
| 7 | .107 | .289 | .110 | 21.667 | 23.296 | 23.199 | 25.134 |
| 8 | .126 | .357 | .129 | 21.486 | 23.280 | 22.878 | 25.374 |
| 9 | .135 | .385 | .138 | 21.393 | 23.264 | 22.702 | 25.500 |
| 10 | .146 | .406 | .147 | 21.299 | 23.239 | 22.517 | 25.623 |
| 11 | .152 | .413 | .153 | 21.251 | 23.220 | 22.421 | 25.679 |
| HUB | .159 | .419 | .159 | 21.197 | 23.196 | 22.312 | 25.744 |

| RP | AERO CHORD | SETTING ANGLE | TOTAL CAMBER | TURNING SOLIDITY | TURNING RATIO | PHISS | CHOKE MARGIN |
|---|---|---|---|---|---|---|---|
| TIP | 5.111 | 59.28 | 8.21 | 1.292 | .599 | 5.12 | .040 |
| 1 | 5.105 | 58.46 | 7.72 | 1.322 | .631 | 4.68 | .040 |
| 2 | 5.103 | 57.62 | 7.56 | 1.350 | .676 | 4.48 | .040 |
| 3 | 5.099 | 55.57 | 8.11 | 1.412 | .814 | 4.68 | .040 |
| 4 | 5.096 | 53.25 | 8.97 | 1.479 | .948 | 4.96 | .040 |
| 5 | 5.095 | 51.71 | 9.80 | 1.523 | .996 | 5.16 | .040 |
| 6 | 5.095 | 50.05 | 10.95 | 1.569 | 1.000 | 5.36 | .040 |
| 7 | 5.096 | 47.66 | 13.00 | 1.635 | 1.001 | 5.73 | .042 |
| 8 | 5.105 | 40.67 | 21.37 | 1.827 | 1.000 | 7.13 | .054 |
| 9 | 5.118 | 36.49 | 28.56 | 1.944 | 1.000 | 8.40 | .069 |
| 10 | 5.146 | 31.70 | 39.79 | 2.082 | 1.000 | 10.65 | .108 |
| 11 | 5.171 | 29.12 | 47.54 | 2.165 | 1.000 | 12.34 | .146 |
| HUB | 5.203 | 25.97 | 56.96 | 2.269 | 1.000 | 14.36 | .192 |

(d) Second-stage stator

| RP | PERCENT SPAN | RADII RI | RADII RO | BLADE ANGLES KIC | BLADE ANGLES KTC | BLADE ANGLES KOC | DELTA INC | CONE ANGLE |
|---|---|---|---|---|---|---|---|---|
| TIP | 0. | 23.622 | 23.622 | 36.44 | 18.58 | -16.16 | 5.75 | .057 |
| 1 | 5. | 23.108 | 23.129 | 36.03 | 19.25 | -14.04 | 5.75 | .279 |
| 2 | 10. | 22.646 | 22.686 | 35.76 | 19.80 | -12.44 | 5.74 | .531 |
| 3 | 20. | 21.728 | 21.802 | 35.53 | 20.71 | -10.38 | 5.69 | .975 |
| 4 | 30. | 20.824 | 20.923 | 35.50 | 21.38 | -9.53 | 5.64 | 1.318 |
| 5 | 36. | 20.287 | 20.400 | 35.74 | 21.82 | -9.30 | 5.59 | 1.504 |
| 6 | 42. | 19.757 | 19.884 | 36.24 | 22.33 | -9.20 | 5.55 | 1.688 |
| 7 | 50. | 19.060 | 19.204 | 37.03 | 23.07 | -9.11 | 5.49 | 1.925 |
| 8 | 70. | 17.367 | 17.566 | 39.81 | 25.20 | -9.53 | 5.33 | 2.663 |
| 9 | 80. | 16.547 | 16.786 | 42.24 | 26.63 | -10.46 | 5.23 | 3.211 |
| 10 | 90. | 15.739 | 16.040 | 45.90 | 28.35 | -12.81 | 5.11 | 4.058 |
| 11 | 95. | 15.338 | 15.682 | 48.24 | 29.31 | -14.71 | 5.02 | 4.649 |
| HUB | 100. | 14.869 | 15.237 | 51.08 | 30.44 | -17.17 | 4.92 | 4.978 |

| RP | BLADE THICKNESSES TI | BLADE THICKNESSES TM | BLADE THICKNESSES TO | AXIAL DIMENSIONS ZI | AXIAL DIMENSIONS ZMC | AXIAL DIMENSIONS ZTC | AXIAL DIMENSIONS ZO |
|---|---|---|---|---|---|---|---|
| TIP | .125 | .356 | .125 | 30.141 | 32.232 | 31.540 | 34.500 |
| 1 | .121 | .350 | .121 | 30.150 | 32.233 | 31.526 | 34.497 |
| 2 | .117 | .345 | .117 | 30.157 | 32.233 | 31.512 | 34.494 |
| 3 | .109 | .335 | .109 | 30.166 | 32.231 | 31.479 | 34.488 |
| 4 | .102 | .326 | .102 | 30.172 | 32.232 | 31.442 | 34.487 |
| 5 | .097 | .321 | .097 | 30.176 | 32.232 | 31.425 | 34.486 |
| 6 | .092 | .315 | .092 | 30.181 | 32.232 | 31.412 | 34.486 |
| 7 | .087 | .308 | .086 | 30.188 | 32.229 | 31.396 | 34.485 |
| 8 | .072 | .290 | .072 | 30.214 | 32.226 | 31.368 | 34.487 |
| 9 | .066 | .281 | .065 | 30.234 | 32.222 | 31.366 | 34.491 |
| 10 | .059 | .273 | .058 | 30.259 | 32.217 | 31.371 | 34.501 |
| 11 | .055 | .269 | .055 | 30.272 | 32.212 | 31.372 | 34.507 |
| HUB | .051 | .264 | .051 | 30.288 | 32.205 | 31.373 | 34.516 |

| RP | AERO CHORD | SETTING ANGLE | TOTAL CAMBER | TURNING SOLIDITY | TURNING RATIO | PHISS | CHOKE MARGIN |
|---|---|---|---|---|---|---|---|
| TIP | 4.426 | 10.14 | 52.60 | 1.253 | 1.000 | 12.03 | .301 |
| 1 | 4.426 | 11.00 | 50.07 | 1.283 | 1.000 | 11.07 | .286 |
| 2 | 4.426 | 11.67 | 48.20 | 1.305 | 1.000 | 10.34 | .274 |
| 3 | 4.427 | 12.59 | 45.90 | 1.360 | 1.000 | 9.35 | .254 |
| 4 | 4.427 | 13.00 | 45.02 | 1.418 | 1.000 | 8.75 | .239 |
| 5 | 4.427 | 13.24 | 45.04 | 1.455 | 1.000 | 8.60 | .231 |
| 6 | 4.428 | 13.54 | 45.44 | 1.493 | 1.000 | 8.64 | .224 |
| 7 | 4.428 | 13.99 | 46.14 | 1.547 | 1.000 | 8.75 | .216 |
| 8 | 4.430 | 15.18 | 49.34 | 1.695 | 1.000 | 9.47 | .199 |
| 9 | 4.432 | 15.95 | 52.70 | 1.778 | 1.000 | 10.52 | .197 |
| 10 | 4.435 | 16.63 | 58.71 | 1.866 | 1.000 | 12.52 | .211 |
| 11 | 4.438 | 16.88 | 62.95 | 1.913 | 1.000 | 13.93 | .228 |
| HUB | 4.439 | 17.13 | 68.25 | 1.971 | 1.000 | 15.66 | .248 |

TABLE IV. - OVERALL PERFORMANCE AT 100 PERCENT

OF DESIGN SPEED

(a) Two-stage fan

| | | | | |
|---|---|---|---|---|
| READING NUMBER | 123 | 1140 | 1157 | 1168 |
| TOTAL PRESSURE RATIO | 2.372 | 2.208 | 2.276 | 2.045 |
| TOTAL TEMPERATURE RATIO | 1.366 | 1.323 | 1.336 | 1.300 |
| ADIABATIC EFFICIENCY | .762 | .784 | .784 | .752 |
| POLYTROPIC EFFICIENCY | .789 | .806 | .807 | .775 |
| WEIGHT FLOW | 30.49 | 32.60 | 32.23 | 32.81 |
| WHEEL SPEED, RPM | 16059.7 | 16004.4 | 16027.7 | 16040.6 |
| PERCENT OF DESIGN SPEED | 100.1 | 99.8 | 99.9 | 100.0 |
| DELTA | .919 | .912 | .914 | .912 |
| THETA | .981 | 1.024 | 1.033 | 1.034 |

(b) First stage

| | | | | |
|---|---|---|---|---|
| READING NUMBER | 123 | 1140 | 1157 | 1168 |
| ROTOR TOTAL PRESSURE RATIO | 1.600 | 1.514 | 1.542 | 1.504 |
| STAGE TOTAL PRESSURE RATIO | 1.564 | 1.489 | 1.516 | 1.479 |
| ROTOR TOTAL TEMPERATURE RATIO | 1.179 | 1.156 | 1.163 | 1.154 |
| STAGE TOTAL TEMPERATURE RATIO | 1.179 | 1.156 | 1.163 | 1.154 |
| ROTOR ADIABATIC EFFICIENCY | .805 | .804 | .807 | .800 |
| STAGE ADIABATIC EFFICIENCY | .764 | .771 | .774 | .765 |
| ROTOR POLYTROPIC EFFICIENCY | .818 | .815 | .819 | .811 |
| STAGE POLYTROPIC EFFICIENCY | .778 | .783 | .787 | .778 |
| ROTOR HEAD RISE COEFFICIENT | .237 | .208 | .218 | .204 |
| STAGE HEAD RISE COEFFICIENT | .224 | .200 | .208 | .195 |
| FLOW COEFFICIENT | .403 | .444 | .436 | .448 |
| **EQUIVALENT VALUES BASED ON STAGE INLET** | | | | |
| WEIGHT FLOW | 30.54 | 32.64 | 32.26 | 32.85 |
| WEIGHT FLOW PER UNIT ANNULUS AREA | 179.38 | 191.69 | 189.49 | 192.94 |
| WEIGHT FLOW PER UNIT FRONTAL AREA | 150.68 | 161.02 | 159.17 | 162.06 |

(c) Second stage

| | | | | |
|---|---|---|---|---|
| READING NUMBER | 123 | 1140 | 1157 | 1168 |
| ROTOR TOTAL PRESSURE RATIO | 1.557 | 1.511 | 1.531 | 1.410 |
| STAGE TOTAL PRESSURE RATIO | 1.516 | 1.482 | 1.502 | 1.383 |
| ROTOR TOTAL TEMPERATURE RATIO | 1.158 | 1.144 | 1.149 | 1.127 |
| STAGE TOTAL TEMPERATURE RATIO | 1.159 | 1.144 | 1.149 | 1.126 |
| ROTOR ADIABATIC EFFICIENCY | .847 | .867 | .864 | .813 |
| STAGE ADIABATIC EFFICIENCY | .792 | .824 | .822 | .765 |
| ROTOR POLYTROPIC EFFICIENCY | .857 | .874 | .872 | .822 |
| STAGE POLYTROPIC EFFICIENCY | .803 | .834 | .832 | .776 |
| ROTOR HEAD RISE COEFFICIENT | .289 | .265 | .275 | .217 |
| STAGE HEAD RISE COEFFICIENT | .271 | .252 | .262 | .204 |
| FLOW COEFFICIENT | .429 | .492 | .474 | .500 |
| **EQUIVALENT VALUES BASED ON STAGE INLET** | | | | |
| WEIGHT FLOW | 21.20 | 23.57 | 22.95 | 23.87 |
| WEIGHT FLOW PER UNIT ANNULUS AREA | 166.38 | 184.97 | 180.18 | 187.37 |
| WEIGHT FLOW PER UNIT FRONTAL AREA | 115.90 | 128.86 | 125.52 | 130.53 |

TABLE V. - OVERALL PERFORMANCE AT 80 PERCENT

OF DESIGN SPEED

(a) Two-stage fan

| | | | | |
|---|---|---|---|---|
| READING NUMBER | 136 | 159 | 172 | 183 |
| TOTAL PRESSURE RATIO | 1.588 | 1.739 | 1.764 | 1.767 |
| TOTAL TEMPERATURE RATIO | 1.177 | 1.210 | 1.237 | 1.226 |
| ADIABATIC EFFICIENCY | .796 | .813 | .740 | .779 |
| POLYTROPIC EFFICIENCY | .809 | .827 | .760 | .796 |
| WEIGHT FLOW | 26.67 | 24.34 | 20.88 | 22.41 |
| WHEEL SPEED, RPM | 12884.1 | 12871.8 | 12867.6 | 12875.2 |
| PERCENT OF DESIGN SPEED | 80.3 | 80.2 | 80.2 | 80.3 |
| DELTA | .927 | .933 | .939 | .936 |
| THETA | .983 | .988 | 1.007 | 1.009 |

(b) First stage

| | | | | |
|---|---|---|---|---|
| READING NUMBER | 136 | 159 | 172 | 183 |
| ROTOR TOTAL PRESSURE RATIO | 1.323 | 1.353 | 1.373 | 1.367 |
| STAGE TOTAL PRESSURE RATIO | 1.310 | 1.337 | 1.344 | 1.345 |
| ROTOR TOTAL TEMPERATURE RATIO | 1.097 | 1.107 | 1.121 | 1.116 |
| STAGE TOTAL TEMPERATURE RATIO | 1.097 | 1.107 | 1.122 | 1.116 |
| ROTOR ADIABATIC EFFICIENCY | .857 | .839 | .782 | .809 |
| STAGE ADIABATIC EFFICIENCY | .824 | .806 | .725 | .764 |
| ROTOR POLYTROPIC EFFICIENCY | .863 | .846 | .791 | .817 |
| STAGE POLYTROPIC EFFICIENCY | .831 | .814 | .736 | .774 |
| ROTOR HEAD RISE COEFFICIENT | .213 | .231 | .243 | .239 |
| STAGE HEAD RISE COEFFICIENT | .205 | .222 | .226 | .226 |
| FLOW COEFFICIENT | .422 | .378 | .318 | .344 |
| **EQUIVALENT VALUES BASED ON STAGE INLET** | | | | |
| WEIGHT FLOW | 26.70 | 24.36 | 20.89 | 22.43 |
| WEIGHT FLOW PER UNIT ANNULUS AREA | 156.81 | 143.07 | 122.72 | 131.75 |
| WEIGHT FLOW PER UNIT FRONTAL AREA | 131.72 | 120.18 | 103.09 | 110.66 |

(c) Second stage

| | | | | |
|---|---|---|---|---|
| READING NUMBER | 136 | 159 | 172 | 183 |
| ROTOR TOTAL PRESSURE RATIO | 1.238 | 1.319 | 1.334 | 1.333 |
| STAGE TOTAL PRESSURE RATIO | 1.212 | 1.301 | 1.312 | 1.313 |
| ROTOR TOTAL TEMPERATURE RATIO | 1.073 | 1.093 | 1.103 | 1.099 |
| STAGE TOTAL TEMPERATURE RATIO | 1.073 | 1.093 | 1.103 | 1.099 |
| ROTOR ADIABATIC EFFICIENCY | .862 | .883 | .835 | .862 |
| STAGE ADIABATIC EFFICIENCY | .775 | .838 | .781 | .816 |
| ROTOR POLYTROPIC EFFICIENCY | .866 | .888 | .841 | .867 |
| STAGE POLYTROPIC EFFICIENCY | .781 | .844 | .790 | .823 |
| ROTOR HEAD RISE COEFFICIENT | .195 | .258 | .273 | .270 |
| STAGE HEAD RISE COEFFICIENT | .175 | .245 | .257 | .256 |
| FLOW COEFFICIENT | .518 | .454 | .383 | .412 |
| **EQUIVALENT VALUES BASED ON STAGE INLET** | | | | |
| WEIGHT FLOW | 21.35 | 19.17 | 16.46 | 17.61 |
| WEIGHT FLOW PER UNIT ANNULUS AREA | 167.55 | 150.49 | 129.21 | 138.26 |
| WEIGHT FLOW PER UNIT FRONTAL AREA | 116.72 | 104.83 | 90.01 | 96.31 |

TABLE VI. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(a) 100 Percent of design speed; reading 123

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | .4 | 46.5 | 70.8 | 61.4 | 288.9 | 1.208 | 9.92 | 1.643 |
| 2 | 23.978 | 23.594 | .6 | 45.4 | 68.1 | 59.7 | 288.5 | 1.200 | 10.13 | 1.619 |
| 3 | 22.537 | 22.250 | 1.4 | 44.2 | 65.1 | 56.2 | 288.7 | 1.184 | 10.12 | 1.621 |
| 4 | 21.092 | 20.907 | .5 | 44.6 | 63.3 | 53.0 | 287.9 | 1.180 | 10.16 | 1.610 |
| 5 | 20.218 | 20.102 | .5 | 46.1 | 62.0 | 51.3 | 288.0 | 1.178 | 10.16 | 1.589 |
| 6 | 19.342 | 19.294 | .5 | 48.0 | 60.8 | 49.3 | 287.8 | 1.176 | 10.16 | 1.567 |
| 7 | 18.166 | 18.219 | .3 | 49.2 | 59.3 | 45.4 | 287.8 | 1.172 | 10.16 | 1.553 |
| 8 | 15.133 | 15.532 | .6 | 49.4 | 54.7 | 26.8 | 287.8 | 1.163 | 10.16 | 1.585 |
| 9 | 13.533 | 14.188 | .9 | 50.2 | 52.1 | 12.8 | 288.0 | 1.163 | 10.16 | 1.609 |
| 10 | 11.854 | 12.845 | 1.0 | 53.1 | 49.1 | -3.9 | 288.1 | 1.168 | 10.15 | 1.634 |
| 11 | 10.973 | 12.172 | 1.0 | 55.6 | 47.5 | -12.5 | 288.4 | 1.169 | 10.15 | 1.604 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 144.7 | 205.3 | 439.4 | 295.4 | 144.7 | 141.3 | .9 | 149.0 | 415.8 | 408.4 |
| 2 | 161.9 | 207.4 | 433.4 | 288.7 | 161.9 | 145.6 | 1.6 | 147.8 | 403.6 | 397.1 |
| 3 | 173.6 | 211.4 | 412.3 | 272.2 | 173.6 | 151.5 | 4.3 | 147.5 | 378.3 | 373.5 |
| 4 | 177.7 | 213.1 | 394.8 | 252.0 | 177.7 | 151.7 | 1.5 | 149.7 | 354.1 | 351.0 |
| 5 | 179.9 | 213.0 | 383.1 | 235.9 | 179.9 | 147.6 | 1.4 | 153.6 | 339.6 | 337.7 |
| 6 | 180.8 | 212.8 | 370.3 | 218.4 | 180.8 | 142.4 | 1.5 | 158.2 | 324.6 | 323.8 |
| 7 | 181.4 | 216.2 | 354.9 | 201.1 | 181.4 | 141.2 | 1.0 | 163.7 | 306.1 | 307.0 |
| 8 | 178.7 | 240.0 | 309.5 | 175.1 | 178.7 | 156.2 | 1.8 | 182.2 | 254.6 | 261.3 |
| 9 | 175.5 | 261.3 | 285.4 | 171.6 | 175.4 | 167.3 | 2.7 | 200.7 | 227.8 | 238.8 |
| 10 | 170.3 | 284.9 | 260.0 | 171.6 | 170.3 | 171.2 | 3.1 | 227.7 | 199.5 | 216.2 |
| 11 | 166.7 | 292.7 | 246.6 | 169.4 | 166.7 | 165.4 | 3.0 | 241.5 | 184.8 | 205.0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .432 | .565 | 1.313 | .814 | .432 | .389 | .976 | 1.558 |
| 2 | .486 | .574 | 1.302 | .799 | .486 | .403 | .899 | 1.500 |
| 3 | .524 | .590 | 1.243 | .759 | .523 | .423 | .873 | 1.430 |
| 4 | .537 | .597 | 1.193 | .706 | .537 | .425 | .854 | 1.423 |
| 5 | .544 | .597 | 1.159 | .662 | .544 | .414 | .820 | 1.410 |
| 6 | .547 | .597 | 1.121 | .613 | .547 | .400 | .787 | 1.402 |
| 7 | .549 | .609 | 1.074 | .566 | .549 | .398 | .779 | 1.405 |
| 8 | .540 | .684 | .936 | .499 | .540 | .446 | .874 | 1.371 |
| 9 | .530 | .751 | .862 | .493 | .530 | .481 | .954 | 1.306 |
| 10 | .513 | .826 | .784 | .498 | .513 | .496 | 1.005 | 1.221 |
| 11 | .502 | .851 | .742 | .492 | .502 | .481 | .992 | 1.168 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 6.2 | 3.9 | 3.0 | .453 | .734 | .227 | .148 | .041 | .027 |
| 2 | 10.00 | 5.2 | 2.7 | 2.5 | .456 | .738 | .220 | .154 | .041 | .028 |
| 3 | 20.00 | 5.1 | 2.0 | 2.1 | .459 | .803 | .166 | .121 | .032 | .023 |
| 4 | 30.00 | 5.9 | 2.5 | 2.8 | .483 | .810 | .165 | .128 | .032 | .025 |
| 5 | 36.00 | 6.2 | 2.6 | 3.8 | .507 | .797 | .181 | .149 | .035 | .029 |
| 6 | 42.00 | 6.5 | 2.6 | 5.1 | .536 | .780 | .203 | .176 | .039 | .034 |
| 7 | 50.00 | 7.1 | 2.9 | 6.4 | .562 | .779 | .212 | .189 | .042 | .037 |
| 8 | 70.00 | 7.8 | 2.9 | 6.9 | .574 | .865 | .153 | .145 | .032 | .030 |
| 9 | 80.00 | 7.7 | 2.8 | 6.3 | .550 | .892 | .139 | .137 | .029 | .028 |
| 10 | 90.00 | 7.4 | 2.6 | 4.8 | .508 | .899 | .156 | .156 | .029 | .029 |
| 11 | 95.00 | 7.1 | 2.6 | 4.1 | .490 | .858 | .238 | .238 | .040 | .040 |

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(b) 100 Percent of design speed; reading 1140

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL EMP IN | TOTAL EMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | -1.1 | 36.5 | 68.7 | 61.1 | 288.8 | 1.169 | 9.94 | 1.507 |
| 2 | 23.978 | 23.594 | -1.5 | 35.2 | 66.3 | 59.8 | 288.5 | 1.163 | 10.13 | 1.491 |
| 3 | 22.537 | 22.250 | -1.1 | 34.7 | 63.5 | 56.9 | 288.2 | 1.154 | 10.13 | 1.503 |
| 4 | 21.092 | 20.907 | -1.6 | 36.4 | 61.5 | 54.6 | 288.0 | 1.152 | 10.15 | 1.484 |
| 5 | 20.218 | 20.102 | -1.4 | 38.9 | 60.1 | 53.8 | 288.0 | 1.151 | 10.15 | 1.454 |
| 6 | 19.342 | 19.294 | -1.4 | 41.4 | 58.9 | 52.8 | 287.9 | 1.150 | 10.15 | 1.425 |
| 7 | 18.166 | 18.219 | -1.6 | 42.5 | 57.2 | 47.9 | 288.0 | 1.151 | 10.16 | 1.440 |
| 8 | 15.133 | 15.532 | -1.1 | 42.7 | 52.7 | 27.1 | 288.0 | 1.154 | 10.15 | 1.579 |
| 9 | 13.533 | 14.188 | -.8 | 44.7 | 50.1 | 15.0 | 288.0 | 1.156 | 10.15 | 1.604 |
| 10 | 11.854 | 12.845 | -.6 | 48.4 | 47.1 | -.7 | 288.2 | 1.163 | 10.15 | 1.608 |
| 11 | 10.973 | 12.172 | -.5 | 49.4 | 45.5 | -7.8 | 288.4 | 1.164 | 10.13 | 1.616 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 162.4 | 198.1 | 447.6 | 329.8 | 162.3 | 159.2 | -3.0 | 117.9 | 414.1 | 406.8 |
| 2 | 178.5 | 199.6 | 443.9 | 324.4 | 178.4 | 163.1 | -4.6 | 115.0 | 401.9 | 395.4 |
| 3 | 190.6 | 204.1 | 426.5 | 306.9 | 190.6 | 167.8 | -3.6 | 116.2 | 378.0 | 373.2 |
| 4 | 195.2 | 202.7 | 408.4 | 281.9 | 195.1 | 163.1 | -5.4 | 120.4 | 353.4 | 350.3 |
| 5 | 197.4 | 199.0 | 396.3 | 262.2 | 197.3 | 154.8 | -5.0 | 125.1 | 338.7 | 336.8 |
| 6 | 198.5 | 196.2 | 384.6 | 243.5 | 198.5 | 147.2 | -4.9 | 129.7 | 324.6 | 323.7 |
| 7 | 199.3 | 204.6 | 368.3 | 225.1 | 199.2 | 150.9 | -5.5 | 138.2 | 304.2 | 305.1 |
| 8 | 196.2 | 246.9 | 323.6 | 203.7 | 196.1 | 181.4 | -3.9 | 167.5 | 253.5 | 260.2 |
| 9 | 192.5 | 266.6 | 299.9 | 196.2 | 192.5 | 189.6 | -2.8 | 187.4 | 227.2 | 238.2 |
| 10 | 186.6 | 290.7 | 273.9 | 192.9 | 186.6 | 192.9 | -2.0 | 217.5 | 198.4 | 215.0 |
| 11 | 182.0 | 304.4 | 259.7 | 199.9 | 182.0 | 198.0 | -1.5 | 231.1 | 183.8 | 203.9 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .488 | .554 | 1.345 | .923 | .488 | .445 | .981 | 1.518 |
| 2 | .539 | .560 | 1.341 | .911 | 539 | 458 | .914 | 1.476 |
| 3 | .578 | .576 | 1.294 | .867 | .578 | .474 | .880 | 1.420 |
| 4 | .594 | .573 | 1.242 | .797 | .593 | .461 | .836 | 1.403 |
| 5 | .601 | .562 | 1.206 | .741 | .601 | .437 | .784 | 1.385 |
| 6 | .605 | .554 | 1.171 | .688 | .604 | .416 | .741 | 1.376 |
| 7 | .607 | .579 | 1.122 | .637 | .607 | .427 | .758 | 1.366 |
| 8 | .597 | .709 | .984 | .585 | .597 | .521 | .925 | 1.372 |
| 9 | .585 | .771 | .911 | .568 | .585 | .548 | .985 | 1.317 |
| 10 | .566 | .847 | .830 | .562 | .566 | .562 | 1.034 | 1.237 |
| 11 | .550 | .893 | .786 | .586 | .550 | .581 | 1.088 | 1.184 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.1 | 1.9 | 2.7 | .364 | .735 | .188 | .113 | .034 | .021 |
| 2 | 10.00 | 3.4 | 1.0 | 2.6 | .367 | .741 | .180 | .113 | .033 | .021 |
| 3 | 20.00 | 3.4 | .4 | 2.8 | .377 | .801 | .139 | .089 | .026 | .017 |
| 4 | 30.00 | 4.1 | .7 | 4.4 | .409 | .784 | .156 | .116 | .029 | .022 |
| 5 | 36.00 | 4.4 | .7 | 6.4 | .440 | .746 | .188 | .154 | .035 | .028 |
| 6 | 42.00 | 4.7 | .8 | 8.6 | .471 | .709 | .221 | .192 | .040 | .035 |
| 7 | 50.00 | 5.1 | .9 | 8.9 | .498 | .725 | .223 | .200 | .042 | .038 |
| 8 | 70.00 | 5.7 | .8 | 7.1 | .497 | .906 | .095 | .084 | .020 | 018 |
| 9 | 80.00 | 5.7 | .8 | 8.4 | .483 | .926 | .085 | .081 | .017 | .017 |
| 10 | 90.00 | 5.4 | .6 | 7.9 | .451 | .893 | .148 | .148 | .028 | .028 |
| 11 9 | 5.00 | 5.2 | .7 | 8.6 | .394 | .899 | .153 | .153 | .026 | .026 |

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(c) 100 Percent of design speed; reading 1157

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | -1.3 | 38.8 | 69.2 | 60.9 | 288.8 | 1.182 | 9.94 | 1.557 |
| 2 | 23.978 | 23.594 | -1.6 | 37.5 | 66.7 | 59.4 | 288.5 | 1.176 | 10.13 | 1.538 |
| 3 | 22.537 | 22.250 | -1.2 | 36.8 | 63.9 | 56.7 | 288.3 | 1.164 | 10.13 | 1.544 |
| 4 | 21.092 | 20.907 | -1.8 | 38.3 | 61.9 | 54.4 | 287.9 | 1.161 | 10.15 | 1.521 |
| 5 | 20.218 | 20.102 | -1.6 | 40.8 | 60.6 | 53.5 | 288.0 | 1.159 | 10.15 | 1.492 |
| 6 | 19.342 | 19.294 | -1.6 | 43.0 | 59.4 | 52.3 | 288.1 | 1.158 | 10.15 | 1.467 |
| 7 | 18.166 | 18.219 | -1.8 | 44.3 | 57.8 | 47.8 | 287.9 | 1.158 | 10.15 | 1.470 |
| 8 | 15.133 | 15.532 | -1.3 | 44.4 | 53.3 | 27.8 | 288.0 | 1.156 | 10.15 | 1.584 |
| 9 | 13.533 | 14.188 | -1.0 | 45.9 | 50.6 | 15.5 | 288.0 | 1.157 | 10.15 | 1.607 |
| 10 | 11.854 | 12.845 | -.6 | 49.9 | 47.6 | -1.0 | 288.1 | 1.164 | 10.15 | 1.617 |
| 11 | 10.973 | 12.172 | -.3 | 51.4 | 46.0 | -8.7 | 288.4 | 1.164 | 10.13 | 1.617 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 159.4 | 201.6 | 448.6 | 322.8 | 159.4 | 157.1 | -3.6 | 126.3 | 415.7 | 408.3 |
| 2 | 175.6 | 203.0 | 443.8 | 316.6 | 175.5 | 160.9 | -4.9 | 123.7 | 402.7 | 396.3 |
| 3 | 187.5 | 206.2 | 426.6 | 300.5 | 187.5 | 165.2 | -3.9 | 123.4 | 379.3 | 374.4 |
| 4 | 191.9 | 204.2 | 407.7 | 275.4 | 191.8 | 160.2 | -5.9 | 126.6 | 353.8 | 350.7 |
| 5 | 194.1 | 201.1 | 395.8 | 256.3 | 194.1 | 152.3 | -5.5 | 131.3 | 339.5 | 337.5 |
| 6 | 195.3 | 198.9 | 383.2 | 237.5 | 195.2 | 145.3 | -5.2 | 135.7 | 324.4 | 323.6 |
| 7 | 196.0 | 205.3 | 367.2 | 218.8 | 195.9 | 146.9 | -6.0 | 143.4 | 304.6 | 305.5 |
| 8 | 192.8 | 242.0 | 322.2 | 195.5 | 192.7 | 172.9 | -4.3 | 169.4 | 253.8 | 260.5 |
| 9 | 189.2 | 261.2 | 297.8 | 188.6 | 189.2 | 181.8 | -3.2 | 187.5 | 226.8 | 237.8 |
| 10 | 183.4 | 285.6 | 271.9 | 184.0 | 183.4 | 184.0 | -1.9 | 218.4 | 198.8 | 215.4 |
| 11 | 178.6 | 297.9 | 257.1 | 188.2 | 178.5 | 186.0 | -1.0 | 232.6 | 184.0 | 204.1 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .478 | .561 | 1.346 | .899 | .478 | .437 | .986 | 1.535 |
| 2 | .530 | .567 | 1.339 | .885 | .530 | .450 | .917 | 1.488 |
| 3 | .568 | .580 | 1.293 | .846 | .568 | .465 | .881 | 1.435 |
| 4 | .583 | .575 | 1.238 | .776 | .583 | .451 | .835 | 1.416 |
| 5 | .590 | .567 | 1.203 | .722 | .590 | .429 | .785 | 1.400 |
| 6 | .594 | .560 | 1.165 | .669 | .594 | .409 | .744 | 1.387 |
| 7 | .596 | .580 | 1.117 | .618 | .596 | .415 | .750 | 1.381 |
| 8 | .586 | .693 | .979 | .560 | .586 | .495 | .897 | 1.384 |
| 9 | .574 | .753 | .904 | .544 | .574 | .524 | .961 | 1.322 |
| 10 | .555 | .830 | .823 | .535 | .555 | .535 | 1.003 | 1.241 |
| 11 | .539 | .870 | .777 | .550 | .539 | .543 | 1.042 | 1.184 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.6 | 2.3 | 2.5 | .388 | .741 | .195 | .116 | .036 | .021 |
| 2 | 10.00 | 3.8 | 1.4 | 2.2 | .392 | .746 | .188 | .119 | .035 | .022 |
| 3 | 20.00 | 3.9 | .9 | 2.6 | .398 | .806 | .143 | .090 | .027 | .017 |
| 4 | 30.00 | 4.6 | 1.2 | 4.2 | .429 | .793 | .157 | .115 | .030 | .022 |
| 5 | 36.00 | 4.9 | 1.2 | 6.1 | .459 | .761 | .186 | .151 | .034 | .028 |
| 6 | 42.00 | 5.1 | 1.3 | 8.1 | .490 | .734 | .213 | .183 | .039 | .033 |
| 7 | 50.00 | 5.6 | 1.4 | 8.8 | .519 | .738 | .221 | .198 | .042 | .037 |
| 8 | 70.00 | 6.3 | 1.4 | 7.8 | .522 | .900 | .103 | .091 | .022 | .019 |
| 9 | 80.00 | 6.2 | 1.2 | 8.9 | .506 | .927 | .085 | .082 | .017 | .017 |
| 10 | 90.00 | 5.9 | 1.1 | 7.7 | .481 | .899 | .142 | .142 | .027 | .026 |
| 11 | 95.00 | 5.7 | 1.2 | 7.8 | .434 | .896 | .161 | .161 | .028 | .028 |

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(d) 100 Percent of design speed; reading 1168

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | -1.1 | 35.3 | 68.7 | 61.0 | 288.7 | 1.166 | 9.94 | 1.493 |
| 2 | 23.978 | 23.594 | -1.3 | 34.3 | 66.1 | 59.8 | 288.6 | 1.159 | 10.13 | 1.473 |
| 3 | 22.537 | 22.250 | -.9 | 33.8 | 63.3 | 57.0 | 288.3 | 1.150 | 10.14 | 1.486 |
| 4 | 21.092 | 20.907 | -1.3 | 35.8 | 61.2 | 54.8 | 288.0 | 1.149 | 10.15 | 1.468 |
| 5 | 20.218 | 20.102 | -1.2 | 38.3 | 59.8 | 53.9 | 288.0 | 1.148 | 10.15 | 1.437 |
| 6 | 19.342 | 19.294 | -1.2 | 40.7 | 58.6 | 52.9 | 288.0 | 1.147 | 10.15 | 1.407 |
| 7 | 18.166 | 18.219 | -1.4 | 42.0 | 57.0 | 48.0 | 288.0 | 1.150 | 10.16 | 1.424 |
| 8 | 15.133 | 15.532 | -1.1 | 42.2 | 52.5 | 26.8 | 287.9 | 1.154 | 10.15 | 1.579 |
| 9 | 13.533 | 14.188 | -.8 | 44.1 | 49.8 | 14.7 | 287.9 | 1.157 | 10.15 | 1.607 |
| 10 | 11.854 | 12.845 | -.6 | 47.7 | 46.9 | -.5 | 288.1 | 1.163 | 10.15 | 1.611 |
| 11 | 10.973 | 12.172 | -.4 | 48.6 | 45.3 | -7.6 | 288.3 | 1.164 | 10.13 | 1.621 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 163.5 | 198.9 | 449.2 | 335.0 | 163.5 | 162.4 | -3.0 | 115.0 | 415.4 | 408.0 |
| 2 | 180.2 | 199.8 | 445.3 | 328.6 | 180.2 | 165.1 | -4.1 | 112.5 | 403.1 | 396.7 |
| 3 | 192.6 | 203.7 | 427.9 | 310.9 | 192.5 | 169.3 | -3.2 | 113.3 | 378.9 | 374.1 |
| 4 | 197.1 | 202.9 | 409.7 | 285.3 | 197.1 | 164.6 | -4.5 | 118.5 | 354.7 | 351.6 |
| 5 | 199.5 | 198.8 | 397.0 | 264.8 | 199.4 | 156.1 | -4.1 | 123.2 | 339.1 | 337.2 |
| 6 | 200.7 | 195.4 | 384.9 | 245.7 | 200.6 | 148.1 | -4.2 | 127.5 | 324.3 | 323.5 |
| 7 | 201.4 | 204.5 | 369.3 | 227.3 | 201.3 | 152.1 | -4.9 | 136.7 | 304.8 | 305.7 |
| 8 | 198.1 | 249.5 | 325.3 | 207.3 | 198.1 | 185.0 | -3.7 | 167.5 | 254.3 | 261.0 |
| 9 | 194.4 | 269.8 | 301.4 | 200.5 | 194.4 | 193.9 | -2.8 | 187.6 | 227.5 | 238.5 |
| 10 | 188.4 | 294.3 | 275.6 | 198.0 | 188.4 | 197.9 | -1.9 | 217.7 | 199.2 | 215.9 |
| 11 | 183.7 | 308.5 | 261.0 | 205.7 | 183.7 | 203.9 | -1.3 | 231.5 | 184.1 | 204.2 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .491 | .558 | 1.350 | .939 | .491 | .455 | .993 | 1.521 |
| 2 | .545 | .562 | 1.346 | .924 | .544 | .464 | .916 | 1.474 |
| 3 | .585 | .576 | 1.299 | .880 | .585 | .479 | .879 | 1.418 |
| 4 | .600 | .574 | 1.247 | .808 | .600 | .466 | .835 | 1.400 |
| 5 | .607 | .562 | 1.209 | .749 | .607 | .441 | .783 | 1.378 |
| 6 | .611 | .552 | 1.173 | .695 | .611 | .419 | .738 | 1.366 |
| 7 | .614 | .579 | 1.126 | .644 | .614 | .431 | .756 | 1.360 |
| 8 | .603 | .717 | .991 | .596 | .603 | .532 | .934 | 1.374 |
| 9 | .591 | .781 | .916 | .581 | .591 | .562 | .998 | 1.318 |
| 10 | .571 | .859 | .836 | .578 | .571 | .578 | 1.051 | 1.240 |
| 11 | .556 | .907 | .790 | .605 | .556 | .599 | 1.110 | 1.184 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.0 | 1.8 | 2.6 | .352 | .733 | .185 | .108 | .034 | .020 |
| 2 | 10.00 | 3.3 | .8 | 2.6 | .357 | .735 | .180 | .113 | .033 | .021 |
| 3 | 20.00 | 3.2 | .2 | 3.0 | .367 | .798 | .138 | .087 | .026 | .016 |
| 4 | 30.00 | 3.9 | .5 | 4.5 | .400 | .777 | .158 | .117 | .029 | .022 |
| 5 | 36.00 | 4.1 | .4 | 6.4 | .432 | .736 | .192 | .159 | .035 | .029 |
| 6 | 42.00 | 4.4 | .5 | 8.8 | .464 | .696 | .227 | .199 | .041 | .036 |
| 7 | 50.00 | 4.8 | .6 | 9.0 | .492 | .711 | .231 | .209 | .043 | .039 |
| 8 | 70.00 | 5.5 | .6 | 6.8 | .489 | .904 | .096 | .084 | .020 | .018 |
| 9 | 80.00 | 5.5 | .5 | 8.1 | .472 | .927 | .083 | .079 | .017 | .016 |
| 10 | 90.00 | 5.2 | .4 | 8.1 | .437 | .893 | .146 | .145 | .027 | .027 |
| 11 | 95.00 | 4.9 | .4 | 8.8 | .374 | .903 | .146 | .146 | .025 | .025 |

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(e) 80 Percent of design speed; reading 136

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | 2.0 | 36.5 | 69.8 | 62.0 | 289.6 | 1.099 | 9.97 | 1.300 |
| 2 | 23.978 | 23.594 | 1.3 | 34.7 | 67.0 | 60.0 | 289.0 | 1.097 | 10.12 | 1.296 |
| 3 | 22.537 | 22.250 | .5 | 33.0 | 64.2 | 56.8 | 288.1 | 1.092 | 10.15 | 1.300 |
| 4 | 21.092 | 20.907 | .4 | 34.4 | 62.2 | 53.6 | 287.9 | 1.091 | 10.15 | 1.303 |
| 5 | 20.218 | 20.102 | .6 | 36.7 | 60.9 | 51.3 | 287.8 | 1.094 | 10.15 | 1.301 |
| 6 | 19.342 | 19.294 | .7 | 39.3 | 59.7 | 48.8 | 287.8 | 1.096 | 10.15 | 1.298 |
| 7 | 18.166 | 18.219 | .7 | 41.3 | 58.0 | 43.8 | 287.8 | 1.099 | 10.15 | 1.302 |
| 8 | 15.133 | 15.532 | 1.1 | 42.7 | 53.3 | 25.9 | 287.9 | 1.097 | 10.15 | 1.352 |
| 9 | 13.533 | 14.188 | 1.4 | 44.7 | 50.5 | 13.1 | 287.9 | 1.100 | 10.15 | 1.369 |
| 10 | 11.854 | 12.845 | 1.7 | 48.5 | 47.4 | -3.6 | 288.1 | 1.107 | 10.15 | 1.399 |
| 11 | 10.973 | 12.172 | 1.7 | 49.9 | 45.9 | -10.7 | 288.1 | 1.109 | 10.14 | 1.402 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 121.3 | 155.6 | 350.8 | 266.2 | 121.2 | 125.1 | 4.3 | 92.6 | 333.5 | 327.6 |
| 2 | 135.9 | 160.0 | 348.2 | 262.6 | 135.9 | 131.4 | 3.1 | 91.2 | 323.7 | 318.5 |
| 3 | 146.5 | 164.4 | 336.1 | 251.5 | 146.5 | 137.9 | 1.3 | 89.6 | 303.8 | 300.0 |
| 4 | 149.4 | 167.4 | 320.5 | 232.7 | 149.4 | 138.1 | 1.0 | 94.7 | 284.5 | 282.0 |
| 5 | 151.0 | 169.6 | 310.5 | 217.6 | 151.0 | 135.9 | 1.5 | 101.4 | 272.8 | 271.2 |
| 6 | 151.8 | 172.0 | 300.9 | 202.1 | 151.8 | 133.1 | 1.8 | 108.9 | 261.5 | 260.9 |
| 7 | 152.2 | 178.4 | 287.2 | 185.6 | 152.2 | 134.0 | 1.9 | 117.8 | 245.5 | 246.2 |
| 8 | 150.0 | 202.5 | 251.0 | 165.5 | 150.0 | 148.9 | 2.9 | 137 2 | 204.2 | 209.6 |
| 9 | 147.3 | 219.9 | 231.4 | 160.5 | 147.2 | 156.3 | 3.7 | 154.7 | 182.3 | 191.1 |
| 10 | 142.9 | 244.2 | 211.0 | 152.2 | 142.8 | 161.9 | 4.2 | 182.9 | 159.5 | 172.8 |
| 11 | 139.7 | 255.3 | 200.5 | 167.3 | 139.6 | 164.4 | 4.2 | 195.4 | 148.1 | 164.3 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .360 | .444 | 1.042 | .759 | .360 | .357 | 1.032 | 1.310 |
| 2 | .405 | .458 | 1.038 | .751 | .405 | .376 | .967 | 1.255 |
| 3 | .439 | .473 | 1.007 | .723 | .439 | .396 | .941 | 1.229 |
| 4 | .448 | .482 | .961 | .670 | .448 | .397 | .924 | 1.214 |
| 5 | .453 | .488 | .931 | .626 | .453 | .391 | .900 | 1.192 |
| 6 | .455 | .495 | .903 | .581 | .455 | .383 | .877 | 1.175 |
| 7 | .457 | .514 | .862 | .534 | .457 | .386 | .881 | 1.146 |
| 8 | .450 | .587 | 753 | .480 | .450 | .432 | .993 | 1.065 |
| 9 | .441 | .641 | .693 | .468 | .441 | .456 | 1.061 | 1.013 |
| 10 | .427 | .716 | .631 | .476 | .427 | .475 | 1.133 | .947 |
| 11 | .418 | .752 | .599 | .493 | .417 | .484 | 1.178 | .911 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 5.2 | 2.9 | 3.6 | .335 | .785 | .130 | .120 | .023 | .021 |
| 2 | 10.00 | 4.2 | 1.7 | 2.8 | .337 | .796 | .122 | .116 | .022 | .021 |
| 3 | 20.00 | 4.1 | 1.1 | 2.7 | .342 | .850 | .090 | .086 | .017 | .016 |
| 4 | 30.00 | 4.9 | 1.5 | 3.4 | .368 | .861 | .089 | .087 | .017 | .017 |
| 5 | 36.00 | 5.1 | 1.5 | 3.9 | .399 | .835 | .113 | .112 | .022 | .022 |
| 6 | 42.00 | 5.5 | 1.6 | 4.6 | .434 | .803 | .144 | .144 | .028 | .028 |
| 7 | 50.00 | 5.8 | 1.6 | 4.8 | .467 | .797 | .163 | .163 | .033 | .033 |
| 8 | 70.00 | 6.3 | 1.4 | 5.9 | .469 | .925 | .075 | .075 | .016 | .016 |
| 9 | 80.00 | 6.2 | 1.2 | 6.6 | .449 | .938 | .072 | .072 | .015 | .015 |
| 10 | 90.00 | 5.7 | .9 | 5.1 | .396 | .940 | .088 | .088 | .016 | .016 |
| 11 | 95.00 | 5.5 | 1.0 | 5.8 | .340 | .932 | .110 | .110 | .019 | .019 |

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(f) 80 Percent of design speed; reading 159

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | 2.1 | 43.4 | 71.8 | 62.7 | 289.6 | 1.116 | 9.99 | 1.354 |
| 2 | 23.978 | 23.594 | 1.2 | 41.9 | 69.3 | 61.1 | 289.0 | 1.113 | 10.12 | 1.341 |
| 3 | 22.537 | 22.250 | .1 | 39.6 | 66.6 | 58.2 | 288.1 | 1.105 | 10.14 | 1.341 |
| 4 | 21.092 | 20.907 | .1 | 41.3 | 64.8 | 55.3 | 287.9 | 1.104 | 10.15 | 1.335 |
| 5 | 20.218 | 20.102 | .3 | 43.8 | 63.6 | 52.8 | 287.8 | 1.106 | 10.15 | 1.335 |
| 6 | 19.342 | 19.294 | .4 | 45.8 | 62.4 | 49.8 | 287.8 | 1.108 | 10.15 | 1.335 |
| 7 | 18.166 | 18.219 | .4 | 47.4 | 60.8 | 44.3 | 287.8 | 1.109 | 10.15 | 1.340 |
| 8 | 15.133 | 15.532 | .8 | 47.1 | 56.4 | 25.9 | 287.8 | 1.103 | 10.15 | 1.362 |
| 9 | 13.533 | 14.188 | 1.2 | 48.2 | 53.7 | 12.7 | 288.0 | 1.104 | 10.15 | 1.378 |
| 10 | 11.854 | 12.845 | 1.5 | 51.9 | 50.7 | -5.3 | 288.0 | 1.110 | 10.14 | 1.405 |
| 11 | 10.973 | 12.172 | 1.6 | 53.7 | 49.1 | -13.1 | 288.2 | 1.110 | 10.14 | 1.396 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 108.5 | 156.3 | 346.4 | 247.3 | 108.5 | 113.6 | 4.0 | 107.3 | 333.0 | 327.1 |
| 2 | 121.6 | 157.7 | 343.2 | 243.2 | 121.6 | 117.4 | 2.5 | 105.3 | 323.4 | 318.3 |
| 3 | 131.2 | 159.2 | 329.9 | 232.7 | 131.2 | 122.7 | .3 | 101.4 | 303.0 | 299.1 |
| 4 | 133.8 | 161.7 | 314.1 | 213.1 | 133.8 | 121.4 | .1 | 106.7 | 284.3 | 281.8 |
| 5 | 135.1 | 165.0 | 303.5 | 196.9 | 135.1 | 119.1 | .8 | 114.1 | 272.5 | 271.0 |
| 6 | 135.8 | 168.9 | 293.4 | 182.3 | 135.8 | 117.7 | 1.0 | 121.2 | 261.0 | 260.4 |
| 7 | 136.3 | 176.2 | 279.6 | 166.6 | 136.3 | 119.3 | 1.0 | 129.6 | 245.1 | 245.9 |
| 8 | 134.4 | 196.7 | 242.6 | 149.0 | 134.4 | 133.9 | 1.9 | 144.1 | 203.9 | 209.3 |
| 9 | 132.0 | 213.8 | 223.0 | 146.1 | 131.9 | 142.6 | 2.8 | 159.3 | 182.5 | 191.4 |
| 10 | 128.0 | 237.4 | 201.9 | 147.2 | 127.9 | 146.6 | 3.5 | 186.7 | 159.7 | 173.1 |
| 11 | 124.9 | 245.6 | 190.9 | 149.4 | 124.9 | 145.5 | 3.6 | 197.8 | 147.9 | 164.1 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .321 | .442 | 1.026 | .700 | .321 | .321 | 1.047 | 1.374 |
| 2 | .361 | .447 | 1.020 | .690 | .361 | .333 | .966 | 1.329 |
| 3 | .391 | .454 | .984 | .664 | .391 | .350 | .935 | 1.297 |
| 4 | .400 | .462 | .938 | .609 | .400 | .347 | .907 | 1.273 |
| 5 | .404 | .471 | .907 | .563 | .404 | .340 | .882 | 1.247 |
| 6 | .406 | .483 | .877 | .521 | .406 | .336 | .866 | 1.226 |
| 7 | .407 | .504 | .836 | .477 | .407 | .341 | .875 | 1.194 |
| 8 | .401 | .568 | .725 | .430 | .401 | .387 | .997 | 1.101 |
| 9 | .394 | .621 | .665 | .424 | .394 | .414 | 1.081 | 1.045 |
| 10 | .381 | .693 | .602 | .430 | .381 | .428 | 1.146 | .971 |
| 11 | .372 | .719 | .569 | .438 | .372 | .426 | 1.165 | .927 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 7.2 | 4.9 | 4.2 | .397 | .779 | .157 | .142 | .027 | .025 |
| 2 | 10.00 | 6.4 | 3.9 | 3.9 | .400 | .778 | .155 | .145 | .027 | .026 |
| 3 | 20.00 | 6.5 | 3.5 | 4.1 | .399 | .836 | .114 | .108 | .021 | .020 |
| 4 | 30.00 | 7.4 | 4.0 | 5.0 | .431 | .828 | .127 | .124 | .023 | .023 |
| 5 | 36.00 | 7.8 | 4.2 | 5.3 | .467 | .810 | .150 | .149 | .028 | .028 |
| 6 | 42.00 | 8.2 | 4.3 | 5.6 | .501 | .796 | .172 | .171 | .033 | .033 |
| 7 | 50.00 | 8.6 | 4.4 | 5.2 | .533 | .799 | .185 | .185 | .037 | .037 |
| 8 | 70.00 | 9.4 | 4.5 | 6.0 | .526 | .896 | .115 | .115 | .024 | .024 |
| 9 | 80.00 | 9.4 | 4.4 | 6.1 | .497 | .928 | .093 | .093 | .019 | .019 |
| 10 | 90.00 | 9.0 | 4.3 | 3.4 | .448 | .930 | .114 | .114 | .021 | .021 |
| 11 | 95.00 | 8.8 | 4.3 | 3.5 | .404 | .907 | .166 | .166 | .028 | .028 |

TABLE VI. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(g) 80 Percent of design speed; reading 172

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | 1.6 | 52.9 | 74.8 | 65.3 | 289.5 | 1.136 | 10.02 | 1.388 |
| 2 | 23.978 | 23.594 | .8 | 53.0 | 72.4 | 64.1 | 288.8 | 1.135 | 10.12 | 1.373 |
| 3 | 22.537 | 22.250 | .1 | 52.0 | 70.0 | 60.6 | 288.1 | 1.130 | 10.14 | 1.370 |
| 4 | 21.092 | 20.907 | .1 | 52.4 | 68.4 | 56.9 | 287.9 | 1.125 | 10.14 | 1.367 |
| 5 | 20.218 | 20.102 | .2 | 53.6 | 67.4 | 54.6 | 287.8 | 1.124 | 10.14 | 1.362 |
| 6 | 19.342 | 19.294 | .1 | 54.7 | 66.4 | 51.4 | 287.9 | 1.123 | 10.14 | 1.359 |
| 7 | 18.166 | 18.219 | .2 | 55.1 | 64.9 | 45.5 | 288.0 | 1.121 | 10.14 | 1.358 |
| 8 | 15.133 | 15.532 | .3 | 51.4 | 61.0 | 25.2 | 287.8 | 1.110 | 10.14 | 1.366 |
| 9 | 13.533 | 14.188 | .7 | 51.0 | 58.6 | 10.8 | 287.9 | 1.109 | 10.14 | 1.391 |
| 10 | 11.854 | 12.845 | 1.2 | 53.7 | 55.7 | -5.8 | 287.9 | 1.111 | 10.14 | 1.401 |
| 11 | 10.973 | 12.172 | 1.5 | 58.4 | 54.2 | -14.6 | 288.1 | 1.111 | 10.14 | 1.384 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 89.9 | 154.8 | 341.8 | 223.4 | 89.8 | 93.5 | 2.4 | 123.4 | 332.2 | 326.3 |
| 2 | 102.0 | 156.0 | 337.0 | 214.6 | 102.0 | 93.9 | 1.5 | 124.6 | 322.7 | 317.6 |
| 3 | 110.4 | 159.3 | 322.4 | 199.5 | 110.4 | 98.0 | .1 | 125.5 | 303.1 | 299.2 |
| 4 | 112.3 | 163.0 | 305.6 | 182.4 | 112.3 | 99.5 | .2 | 129.0 | 284.4 | 281.9 |
| 5 | 113.4 | 165.6 | 295.1 | 169.4 | 113.4 | 98.2 | .5 | 133.3 | 272.9 | 271.3 |
| 6 | 114.0 | 168.8 | 284.4 | 156.6 | 114.0 | 97.6 | .3 | 137.7 | 260.8 | 260.1 |
| 7 | 114.4 | 174.9 | 269.7 | 142.9 | 114.4 | 100.2 | .3 | 143.4 | 244.5 | 245.2 |
| 8 | 112.8 | 194.6 | 232.3 | 134.1 | 112.8 | 121.3 | .7 | 152.1 | 203.8 | 209.2 |
| 9 | 110.8 | 213.6 | 212.5 | 137.0 | 110.8 | 134.6 | 1.4 | 165.9 | 182.7 | 191.5 |
| 10 | 107.6 | 232.3 | 190.7 | 138.3 | 107.5 | 137.6 | 2.3 | 187.1 | 159.8 | 173.2 |
| 11 | 105.0 | 238.5 | 179.3 | 136.5 | 105.0 | 132.1 | 2.7 | 198.6 | 148.0 | 164.2 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .265 | .434 | 1.009 | .626 | .265 | .262 | 1.041 | 1.473 |
| 2 | .302 | .438 | .998 | .603 | .302 | .264 | .921 | 1.432 |
| 3 | .328 | .449 | .958 | .563 | .328 | .277 | .886 | 1.377 |
| 4 | .334 | .461 | .908 | .516 | .334 | .282 | .887 | 1.348 |
| 5 | .337 | .469 | .877 | .480 | .337 | .278 | .866 | 1.322 |
| 6 | .339 | .479 | .845 | .444 | .339 | .277 | .856 | 1.296 |
| 7 | .340 | .497 | .802 | .406 | .340 | .285 | .876 | 1.257 |
| 8 | .335 | .560 | .691 | .386 | .335 | .349 | 1.076 | 1.157 |
| 9 | .329 | .619 | .631 | .397 | .329 | .390 | 1.214 | 1.095 |
| 10 | .319 | .677 | .566 | .403 | .319 | .401 | 1.280 | 1.010 |
| 11 | .312 | .697 | .532 | .399 | .312 | .386 | 1.258 | .958 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 10.2 | 8.0 | 6.8 | .478 | .723 | .228 | .203 | .036 | .032 |
| 2 | 10.00 | 9.5 | 7.1 | 6.9 | .496 | .703 | .246 | .228 | .039 | .036 |
| 3 | 20.00 | 9.9 | 6.9 | 6.5 | .515 | .725 | .236 | .226 | .040 | .038 |
| 4 | 30.00 | 11.1 | 7.7 | 6.7 | .539 | .745 | .230 | .225 | .041 | .040 |
| 5 | 36.00 | 11.6 | 8.0 | 7.1 | .565 | .743 | .242 | .240 | .044 | .043 |
| 6 | 42.00 | 12.1 | 8.2 | 7.3 | .593 | .742 | .256 | .255 | .048 | .047 |
| 7 | 50.00 | 12.7 | 8.5 | 6.5 | .619 | .754 | .261 | .261 | .051 | .051 |
| 8 | 70.00 | 14.3 | 9.1 | 5.2 | .579 | .851 | .187 | .187 | .040 | .040 |
| 9 | 80.00 | 14.2 | 9.3 | 4.2 | .523 | .911 | .131 | .131 | .027 | .027 |
| 10 | 90.00 | 14.0 | 9.2 | 2.9 | .463 | .915 | .154 | .154 | .029 | .029 |
| 11 | 95.00 | 13.8 | 9.3 | 1.9 | .439 | .877 | .250 | .250 | .042 | .042 |

TABLE VI. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE ROTOR

(h) 80 Percent of design speed; reading 183

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 24.704 | 24.265 | 1.8 | 47.9 | 73.5 | 63.8 | 289.7 | 1.126 | 10.01 | 1.380 |
| 2 | 23.978 | 23.594 | 1.0 | 47.7 | 71.0 | 62.4 | 288.9 | 1.125 | 10.12 | 1.365 |
| 3 | 22.537 | 22.250 | .0 | 46.5 | 68.6 | 59.8 | 288.1 | 1.118 | 10.14 | 1.359 |
| 4 | 21.092 | 20.907 | .2 | 47.9 | 66.9 | 56.3 | 287.9 | 1.116 | 10.14 | 1.356 |
| 5 | 20.218 | 20.102 | .3 | 49.6 | 65.7 | 53.7 | 288.0 | 1.117 | 10.14 | 1.354 |
| 6 | 19.342 | 19.294 | .3 | 51.3 | 64.5 | 50.6 | 287.9 | 1.117 | 10.14 | 1.351 |
| 7 | 18.166 | 18.219 | .3 | 52.2 | 63.1 | 45.0 | 287.9 | 1.117 | 10.14 | 1.354 |
| 8 | 15.133 | 15.532 | .6 | 49.7 | 58.9 | 25.1 | 287.8 | 1.107 | 10.14 | 1.366 |
| 9 | 13.533 | 14.188 | 1.0 | 49.8 | 56.4 | 11.3 | 287.9 | 1.107 | 10.14 | 1.390 |
| 10 | 11.854 | 12.845 | 1.4 | 52.9 | 53.4 | -5.4 | 287.9 | 1.110 | 10.14 | 1.401 |
| 11 | 10.973 | 12.172 | 1.5 | 55.5 | 51.8 | -14.1 | 288.1 | 1.111 | 10.14 | 1.386 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 97.9 | 155.8 | 344.9 | 236.5 | 97.9 | 104.4 | 3.2 | 115.7 | 333.9 | 327.9 |
| 2 | 110.5 | 156.6 | 339.5 | 227.9 | 110.5 | 105.4 | 2.0 | 115.8 | 322.9 | 317.8 |
| 3 | 119.4 | 157.6 | 327.0 | 215.6 | 119.4 | 108.5 | .1 | 114.3 | 304.6 | 300.7 |
| 4 | 121.6 | 161.6 | 309.4 | 195.4 | 121.6 | 108.4 | .5 | 119.9 | 285.0 | 282.5 |
| 5 | 122.8 | 164.6 | 298.2 | 180.3 | 122.8 | 106.6 | .6 | 125.4 | 272.3 | 270.7 |
| 6 | 123.5 | 168.1 | 287.2 | 165.7 | 123.5 | 105.2 | .6 | 131.2 | 259.9 | 259.3 |
| 7 | 123.9 | 174.8 | 273.6 | 151.5 | 123.9 | 107.1 | .6 | 138.2 | 244.6 | 245.3 |
| 8 | 122.2 | 196.0 | 236.4 | 139.9 | 122.1 | 126.7 | 1.3 | 149.6 | 203.6 | 209.0 |
| 9 | 120.0 | 214.6 | 216.9 | 141.3 | 120.0 | 138.5 | 2.1 | 163.9 | 182.8 | 191.7 |
| 10 | 116.5 | 234.0 | 195.5 | 141.8 | 116.4 | 141.2 | 2.8 | 186.5 | 159.9 | 173.2 |
| 11 | 114.0 | 240.8 | 184.4 | 140.7 | 113.9 | 136.5 | 3.0 | 198.3 | 148.0 | 164.2 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .289 | .439 | 1.019 | .666 | .289 | .294 | 1.067 | 1.433 |
| 2 | .328 | .442 | 1.007 | .643 | .328 | .297 | .954 | 1.387 |
| 3 | .355 | .447 | .973 | .611 | .355 | .308 | .909 | 1.352 |
| 4 | .362 | .459 | .921 | .555 | .362 | .308 | .891 | 1.317 |
| 5 | .366 | .468 | .888 | .512 | .366 | .303 | .868 | 1.287 |
| 6 | .368 | .478 | .856 | .471 | .368 | .299 | .852 | 1.258 |
| 7 | .369 | .498 | .815 | .432 | .369 | .305 | .865 | 1.228 |
| 8 | .364 | .565 | .704 | .403 | .364 | .365 | 1.037 | 1.130 |
| 9 | .357 | .623 | .646 | .410 | .357 | .402 | 1.155 | 1.073 |
| 10 | .346 | .683 | .582 | .414 | .346 | .412 | 1.213 | .992 |
| 11 | .339 | .704 | .548 | .411 | .339 | .399 | 1.198 | .943 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 8.9 | 6.7 | 5.4 | .436 | .764 | .181 | .161 | .030 | .027 |
| 2 | 10.00 | 8.1 | 5.7 | 5.2 | .450 | .746 | .197 | .182 | .033 | .031 |
| 3 | 20.00 | 8.5 | 5.5 | 5.7 | .460 | .773 | .177 | .168 | .031 | .029 |
| 4 | 30.00 | 9.5 | 6.1 | 6.1 | .493 | .782 | .181 | .177 | .033 | .032 |
| 5 | 36.00 | 9.9 | 6.3 | 6.3 | .525 | .775 | .199 | .197 | .037 | .036 |
| 6 | 42.00 | 10.3 | 6.4 | 6.4 | .558 | .766 | .219 | .219 | .041 | .041 |
| 7 | 50.00 | 10.9 | 6.7 | 6.0 | .588 | .775 | .226 | .226 | .045 | .045 |
| 8 | 70.00 | 11.9 | 7.0 | 5.1 | .558 | .867 | .159 | .159 | .034 | .034 |
| 9 | 80.00 | 12.1 | 7.1 | 4.8 | .511 | .923 | .108 | .108 | .022 | .022 |
| 10 | 90.00 | 11.8 | 7.0 | 3.3 | .457 | .920 | .138 | .138 | .026 | .026 |
| 11 | 95.00 | 11.5 | 7.0 | 2.5 | .431 | .883 | .225 | .225 | .038 | .038 |

TABLE VII. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(a) 100 Percent of design speed; reading 123

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 42.9 | 3.1 | 42.9 | 3.1 | 349.0 | 1.000 | 16.30 | .981 |
| 2 | 23.167 | 23.200 | 41.6 | 2.3 | 41.6 | 2.3 | 346.2 | 1.000 | 16.40 | .979 |
| 3 | 21.981 | 22.068 | 40.2 | 2.3 | 40.2 | 2.3 | 341.9 | 1.000 | 16.40 | .984 |
| 4 | 20.787 | 20.927 | 40.6 | 2.0 | 40.6 | 2.0 | 339.7 | 1.000 | 16.35 | .982 |
| 5 | 20.071 | 20.244 | 42.2 | 1.8 | 42.2 | 1.8 | 339.1 | 1.000 | 16.14 | .980 |
| 6 | 19.350 | 19.558 | 44.2 | -.2 | 44.2 | -.2 | 338.4 | 1.000 | 15.92 | .978 |
| 7 | 18.387 | 18.649 | 45.5 | -.5 | 45.5 | -.5 | 337.4 | 1.000 | 15.78 | .984 |
| 8 | 15.961 | 16.388 | 46.1 | .8 | 46.1 | .8 | 334.7 | 1.000 | 16.10 | .982 |
| 9 | 14.752 | 15.263 | 47.5 | 2.7 | 47.5 | 2.7 | 335.0 | 1.000 | 16.35 | .976 |
| 10 | 13.492 | 14.143 | 51.5 | 6.0 | 51.5 | 6.0 | 336.4 | 1.000 | 16.59 | .947 |
| 11 | 12.868 | 13.586 | 55.0 | -.9 | 55.0 | -.9 | 337.0 | 1.000 | 16.27 | .934 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 223.3 | 166.6 | 223.3 | 166.6 | 163.5 | 166.4 | 152.2 | 9.0 | .0 | .0 |
| 2 | 226.8 | 168.1 | 226.8 | 168.1 | 169.7 | 168.0 | 150.5 | 6.8 | .0 | .0 |
| 3 | 231.1 | 170.5 | 231.1 | 170.5 | 176.4 | 170.3 | 149.3 | 6.7 | .0 | .0 |
| 4 | 231.2 | 167.0 | 231.2 | 167.0 | 175.5 | 166.9 | 150.5 | 5.8 | .0 | .0 |
| 5 | 229.0 | 159.9 | 229.0 | 159.9 | 169.6 | 159.9 | 153.8 | 5.0 | .0 | .0 |
| 6 | 226.4 | 152.3 | 226.4 | 152.3 | 162.4 | 152.3 | 157.8 | -.5 | .0 | .0 |
| 7 | 227.6 | 149.5 | 227.6 | 149.5 | 159.6 | 149.5 | 162.2 | -1.2 | .0 | .0 |
| 8 | 245.9 | 160.5 | 245.9 | 160.5 | 170.4 | 160.5 | 177.3 | 2.4 | .0 | .0 |
| 9 | 262.3 | 167.0 | 262.3 | 167.0 | 177.4 | 166.8 | 193.3 | 7.7 | .0 | .0 |
| 10 | 276.9 | 160.3 | 276.9 | 160.3 | 172.2 | 159.4 | 216.8 | 16.9 | .0 | .0 |
| 11 | 278.9 | 140.6 | 278.9 | 140.6 | 160.0 | 140.6 | 228.4 | -2.1 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .619 | .454 | .619 | .454 | .453 | .453 | 1.018 | .940 |
| 2 | .632 | .460 | .632 | .460 | .473 | .460 | .990 | .918 |
| 3 | .649 | .470 | .649 | .470 | .496 | .470 | .965 | .896 |
| 4 | .652 | .462 | .652 | .462 | .495 | .461 | .951 | .893 |
| 5 | .646 | .442 | .646 | .442 | .478 | .442 | .942 | .908 |
| 6 | .639 | .420 | .639 | .420 | .458 | .420 | .938 | .927 |
| 7 | .643 | .413 | .643 | .413 | .451 | .413 | .937 | .941 |
| 8 | .703 | .446 | .703 | .446 | .487 | .446 | .942 | .976 |
| 9 | .755 | .465 | .755 | .465 | .510 | .464 | .940 | 1.033 |
| 10 | .800 | .445 | .800 | .445 | .497 | .442 | .926 | 1.151 |
| 11 | .806 | .388 | .806 | .388 | .462 | .388 | .879 | 1.225 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 8.7 | 2.7 | 17.9 | .500 | .000 | .083 | .083 | .032 | .032 |
| 2 | 10.00 | 7.5 | 1.5 | 15.1 | .496 | .000 | .089 | .089 | .033 | .033 |
| 3 | 20.00 | 6.2 | .3 | 13.2 | .481 | .000 | .065 | .065 | .023 | .023 |
| 4 | 30.00 | 6.3 | .4 | 12.2 | .487 | .000 | .071 | .071 | .024 | .024 |
| 5 | 36.00 | 7.4 | 1.6 | 11.6 | .512 | .000 | .080 | .080 | .026 | .026 |
| 6 | 42.00 | 8.6 | 2.9 | 9.5 | .546 | .000 | .090 | .090 | .028 | .028 |
| 7 | 50.00 | 8.8 | 3.1 | 9.1 | .556 | .000 | .066 | .066 | .020 | .020 |
| 8 | 70.00 | 5.9 | .5 | 10.7 | .530 | .000 | .066 | .066 | .017 | .017 |
| 9 | 80.00 | 4.8 | -.5 | 13.3 | .531 | .000 | .075 | .075 | .018 | .018 |
| 10 | 90.00 | 5.9 | .8 | 18.6 | .577 | .000 | .155 | .155 | .034 | .034 |
| 11 | 95.00 | 7.8 | 2.8 | 13.2 | .666 | .000 | .189 | .189 | .040 | .040 |

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(b) 100 Percent of design speed, reading 1140

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 32.9 | 1.5 | 32.9 | 1.5 | 337.7 | 1.000 | 14.98 | .985 |
| 2 | 23.187 | 23.200 | 31.4 | .7 | 31.4 | .7 | 335.5 | 1.000 | 15.10 | .989 |
| 3 | 21.981 | 22.068 | 30.8 | -.6 | 30.8 | -.6 | 332.6 | 1.000 | 15.23 | .990 |
| 4 | 20.787 | 20.927 | 32.5 | -.5 | 32.5 | -.5 | 331.8 | 1.000 | 15.07 | .990 |
| 5 | 20.071 | 20.244 | 35.0 | -.3 | 35.0 | -.3 | 331.6 | 1.000 | 14.76 | .990 |
| 6 | 19.350 | 19.558 | 37.5 | -1.5 | 37.5 | -1.5 | 331.2 | 1.000 | 14.47 | .989 |
| 7 | 18.387 | 18.649 | 38.6 | -1.4 | 38.6 | -1.4 | 331.6 | 1.000 | 14.62 | .983 |
| 8 | 15.961 | 16.388 | 39.2 | .4 | 39.2 | .4 | 332.3 | 1.000 | 16.03 | .981 |
| 9 | 14.732 | 15.263 | 41.7 | .6 | 41.7 | .6 | 332.9 | 1.000 | 16.29 | .984 |
| 10 | 13.492 | 14.143 | 46.8 | 1.7 | 46.8 | 1.7 | 335.1 | 1.000 | 16.32 | .969 |
| 11 | 12.868 | 13.586 | 48.8 | -.6 | 48.8 | -.6 | 335.5 | 1.000 | 16.36 | .927 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 221.6 | 175.8 | 221.6 | 175.8 | 186.0 | 175.7 | 120.4 | 4.5 | .0 | .0 |
| 2 | 225.1 | 181.4 | 225.1 | 181.4 | 192.2 | 181.4 | 117.1 | 2.1 | .0 | .0 |
| 3 | 229.8 | 186.1 | 229.8 | 186.1 | 197.5 | 186.1 | 117.6 | -2.1 | 0 | .0 |
| 4 | 225.5 | 180.8 | 225.5 | 180.8 | 190.2 | 180.8 | 121.1 | -1.5 | .0 | .0 |
| 5 | 218.2 | 171.8 | 218.2 | 171.8 | 178.7 | 171.8 | 125.3 | -1.0 | .0 | .0 |
| 6 | 212.3 | 163.1 | 212.3 | 163.1 | 168.3 | 163.1 | 129.3 | -4.4 | .0 | .0 |
| 7 | 219.3 | 165.4 | 219.3 | 165.4 | 171.4 | 165.3 | 136.9 | -4.0 | .0 | .0 |
| 8 | 258.2 | 196.9 | 258.2 | 196.9 | 200.2 | 196.9 | 163.0 | 1.5 | .0 | .0 |
| 9 | 271.4 | 209.7 | 271.4 | 209.7 | 202.7 | 209.7 | 180.5 | 2.4 | .0 | .0 |
| 10 | 284.1 | 207.4 | 284.1 | 207.4 | 194.6 | 207.4 | 207.0 | 6.1 | .0 | .0 |
| 11 | 290.4 | 191.2 | 290.4 | 191.2 | 191.2 | 191.2 | 218.6 | -1.9 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .625 | .489 | .625 | .489 | .524 | .488 | .945 | .674 |
| 2 | .637 | .507 | .637 | .507 | .544 | .507 | .944 | .637 |
| 3 | .655 | .523 | .655 | .523 | .563 | .523 | .942 | .655 |
| 4 | .643 | .508 | .643 | .508 | .542 | .508 | .950 | .643 |
| 5 | .620 | .481 | .620 | .481 | .508 | .481 | .961 | .652 |
| 6 | .603 | .456 | .603 | .456 | .478 | .456 | .969 | .693 |
| 7 | .624 | .463 | .624 | .463 | .487 | .463 | .965 | .721 |
| 8 | .745 | .555 | .745 | .555 | .578 | .555 | .983 | .766 |
| 9 | .787 | .593 | .787 | .593 | .588 | .593 | 1.034 | .844 |
| 10 | .825 | .584 | .825 | .584 | .565 | .584 | 1.066 | 1.001 |
| 11 | .846 | .536 | .846 | .536 | .557 | .536 | 1.000 | 1.058 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | -2.9 | -8.8 | 14.8 | .407 | .000 | .067 | .067 | .026 | .026 |
| 2 | 10.00 | -4.2 | -10.2 | 12.0 | .385 | .000 | .047 | .047 | .017 | .017 |
| 3 | 20.00 | -4.8 | -10.7 | 8.8 | .375 | .000 | .041 | .041 | .014 | .014 |
| 4 3 | 0.00 | -3.4 | -9.2 | 8.2 | .380 | .000 | .041 | .041 | .014 | .014 |
| 5 | 36.00 | -1.3 | -7.1 | 8.0 | .400 | .000 | .045 | .045 | .015 | .015 |
| 6 | 42.00 | .5 | -5.3 | 6.7 | .428 | .000 | .052 | .052 | .016 | .016 |
| 7 | 50.00 | .4 | -5.2 | 6.6 | .436 | .000 | .074 | .074 | .022 | .022 |
| 8 | 70.00 | -2.5 | -8.0 | 8.8 | .398 | .000 | .061 | .061 | .016 | .016 |
| 9 | 80.00 | -2.5 | -7.8 | 9.8 | .383 | .000 | .049 | .049 | .012 | .012 |
| 10 | 90.00 | -.3 | -5.5 | 12.7 | .423 | .000 | .087 | .087 | .019 | .019 |
| 11 | 95.00 | .2 | -4.9 | 12.0 | .498 | .000 | .195 | .195 | .041 | .041 |

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(c) 100 Percent of design speed; reading 1157

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 35.1 | 2.6 | 35.1 | 2.6 | 341.4 | 1.000 | 15.48 | .983 |
| 2 | 23.167 | 23.200 | 33.6 | 1.6 | [illegible] | 1.6 | 339.1 | 1.000 | 15.59 | .986 |
| 3 | 21.981 | 22.068 | 32.8 | .0 | [illegible] | .0 | 335.5 | 1.000 | 15.65 | .988 |
| 4 | 20.787 | 20.927 | 34.3 | .4 | [illegible] | .4 | 334.2 | 1.000 | 15.45 | .989 |
| 5 | 20.071 | 20.244 | 36.8 | .5 | [illegible] | .5 | 333.9 | 1.000 | 15.15 | .989 |
| 6 | 19.350 | 19.558 | 39.2 | -1.0 | 39.2 | -1.0 | 333.5 | 1.000 | 14.89 | .986 |
| 7 | 18.387 | 18.649 | 40.5 | -1.2 | 40.5 | -1.2 | 333.3 | 1.000 | 14.93 | .986 |
| 8 | 15.961 | 16.388 | 40.9 | .6 | 40.9 | .6 | 332.9 | 1.000 | 16.09 | .984 |
| 9 | 14.732 | 15.263 | 43.0 | .7 | 43.0 | .7 | 333.1 | 1.000 | 16.32 | .982 |
| 10 | 13.492 | 14.143 | 48.3 | 2.5 | 48.3 | 2.5 | 335.3 | 1.000 | 16.42 | .965 |
| 11 | 12.868 | 13.586 | 50.7 | -.4 | 50.7 | -.4 | 335.8 | 1.000 | 16.38 | .929 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 224.1 | 175.6 | 224.1 | 175.6 | 183.3 | 175.5 | 129.0 | 7.9 | .0 | .0 |
| 2 | 227.4 | 180.1 | 227.4 | 180.1 | 189.3 | 180.1 | 126.0 | 5.2 | .0 | .0 |
| 3 | 230.7 | 183.1 | 230.7 | 183.1 | 194.0 | 183.1 | 124.9 | .1 | .0 | .0 |
| 4 | 225.7 | 177.1 | 225.7 | 177.1 | 186.4 | 177.1 | 127.4 | 1.1 | .0 | .0 |
| 5 | 219.4 | 168.1 | 219.4 | 168.1 | 175.6 | 168.1 | 131.5 | 1.6 | .0 | .0 |
| 6 | 214.2 | 159.4 | 214.2 | 159.4 | 166.0 | 159.4 | 135.3 | -2.8 | .0 | .0 |
| 7 | 218.9 | 160.6 | 218.9 | 160.6 | 166.5 | 160.6 | 142.1 | -3.3 | .0 | .0 |
| 8 | 251.6 | 186.2 | 251.6 | 186.2 | 190.1 | 186.2 | 164.8 | 2.0 | .0 | .0 |
| 9 | 265.0 | 196.6 | 265.0 | 196.6 | 193.9 | 196.6 | 180.6 | 2.4 | .0 | .0 |
| 10 | 278.7 | 192.8 | 278.7 | 192.8 | 185.5 | 192.7 | 208.0 | 8.5 | .0 | .0 |
| 11 | 284.2 | 174.4 | 284.2 | 174.4 | 179.9 | 174.4 | 220.1 | -1.2 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .629 | .485 | .629 | .485 | .514 | .485 | .957 | .740 |
| 2 | .641 | .500 | .641 | .500 | .534 | .500 | .951 | .691 |
| 3 | .655 | .512 | .655 | .512 | .551 | .512 | .944 | .655 |
| 4 | .641 | .495 | .641 | .495 | .529 | .495 | .950 | .657 |
| 5 | .622 | .469 | .622 | .469 | .498 | .469 | .957 | .708 |
| 6 | .606 | .444 | .606 | .444 | .470 | .444 | .960 | .735 |
| 7 | .621 | .448 | .621 | .448 | .472 | .448 | .964 | .760 |
| 8 | .723 | .523 | .723 | .523 | .546 | .523 | .979 | .812 |
| 9 | .766 | .554 | .766 | .554 | .560 | .554 | 1.014 | .866 |
| 10 | .807 | .541 | .807 | .541 | .537 | .540 | 1.039 | 1.020 |
| 11 | .825 | .486 | .825 | .486 | .522 | .486 | .970 | 1.085 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | -.8 | -6.8 | 15.7 | .403 | .000 | .072 | .072 | .028 | .028 |
| 2 | 10.00 | -2.1 | -8.1 | 12.7 | .40[illegible] | .000 | .058 | .058 | .022 | .022 |
| 3 | 20.00 | -3.0 | -8.9 | 9.3 | .396 | .000 | .050 | .050 | .018 | .018 |
| 4 | 30.00 | -1.7 | -7.5 | 8.9 | .403 | .000 | .044 | .044 | .015 | .015 |
| 5 | 36.00 | .4 | -5.4 | 8.7 | .425 | .000 | .049 | .049 | .016 | .016 |
| 6 | 42.00 | 2.0 | -3.8 | 7.0 | .457 | .000 | .063 | .063 | .020 | .020 |
| 7 | 50.00 | 2.1 | -3.6 | 6.7 | .463 | .000 | .059 | .059 | .018 | .018 |
| 8 | 70.00 | -1.0 | -6.4 | 8.8 | .426 | .000 | .056 | .056 | .014 | .014 |
| 9 | 80.00 | -1.4 | -6.7 | 9.7 | .417 | .000 | .056 | .056 | .013 | .013 |
| 10 | 90.00 | 1.0 | -4.1 | 13.4 | .463 | .000 | .100 | .100 | .022 | .022 |
| 11 | 95.00 | 1.9 | -3.1 | 12.0 | .547 | .000 | .197 | .197 | .042 | .042 |

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(d) 100 Percent of design speed; reading 1168

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 31.7 | 1.5 | 31.7 | 1.5 | 336.5 | 1.000 | 14.84 | .984 |
| 2 | 23.167 | 23.200 | 30.5 | .6 | 30.5 | .6 | 334.5 | 1.000 | 14.93 | .989 |
| 3 | 21.981 | 22.068 | 29.9 | -.8 | 29.9 | -.8 | 331.6 | 1.000 | 15.06 | .990 |
| 4 | 20.787 | 20.927 | 31.8 | -.6 | 31.8 | -.6 | 331.0 | 1.000 | 14.90 | .991 |
| 5 | 20.071 | 20.244 | 34.4 | -.4 | 34.4 | -.4 | 330.8 | 1.000 | 14.59 | .990 |
| 6 | 19.350 | 19.558 | 36.9 | -1.5 | 36.9 | -1.5 | 330.5 | 1.000 | 14.28 | .991 |
| 7 | 18.387 | 18.649 | 38.1 | -1.0 | 38.1 | -1.0 | 331.1 | 1.000 | 14.46 | .984 |
| 8 | 15.961 | 16.388 | 38.5 | .6 | 38.5 | .6 | 332.2 | 1.000 | 16.03 | .978 |
| 9 | 14.732 | 15.263 | 41.0 | .9 | 41.0 | .9 | 333.0 | 1.000 | 16.32 | .982 |
| 10 | 13.492 | 14.143 | 46.1 | 1.8 | 46.1 | 1.8 | 335.2 | 1.000 | 16.35 | .964 |
| 11 | 12.868 | 13.586 | 48.1 | -.1 | 48.1 | -.1 | 335.6 | 1.000 | 16.42 | .923 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 223.4 | 177.7 | 223.4 | 177.7 | 190.1 | 177.7 | 117.4 | 4.6 | .0 | .0 |
| 2 | 226.0 | 183.0 | 226.0 | 183.0 | 194.8 | 183.0 | 114.6 | 2.0 | .0 | .0 |
| 3 | 230.1 | 187.7 | 230.1 | 187.7 | 199.5 | 187.6 | 114.7 | -2.6 | .0 | .0 |
| 4 | 226.1 | 182.6 | 226.1 | 182.6 | 192.2 | 182.6 | 119.2 | -2.0 | .0 | .0 |
| 5 | 218.5 | 173.5 | 218.5 | 173.5 | 180.3 | 173.5 | 123.4 | -1.3 | .0 | .0 |
| 6 | 211.9 | 164.9 | 211.9 | 164.9 | 169.5 | 164.8 | 127.1 | -4.3 | .0 | .0 |
| 7 | 219.6 | 167.8 | 219.6 | 167.8 | 172.8 | 167.7 | 135.5 | -2.9 | .0 | .0 |
| 8 | 261.6 | 202.3 | 261.6 | 202.3 | 204.6 | 202.3 | 163.0 | 2.3 | .0 | .0 |
| 9 | 275.3 | 216.1 | 275.3 | 216.1 | 207.7 | 216.0 | 180.7 | 3.5 | .0 | .0 |
| 10 | 287.8 | 214.5 | 287.8 | 214.5 | 199.7 | 214.4 | 207.3 | 6.7 | .0 | .0 |
| 11 | 294.2 | 200.4 | 294.2 | 200.4 | 196.6 | 200.4 | 218.9 | -.5 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .631 | .495 | .631 | .495 | .537 | .495 | .935 | .631 |
| 2 | .641 | .512 | .641 | .512 | .553 | .512 | .939 | .641 |
| 3 | .657 | .528 | .657 | .528 | .570 | .528 | .941 | .657 |
| 4 | .645 | .514 | .645 | .514 | .548 | .514 | .950 | .645 |
| 5 | .622 | .487 | .622 | .487 | .513 | .487 | .962 | .622 |
| 6 | .602 | .462 | .602 | .462 | .482 | .462 | .973 | .669 |
| 7 | .625 | .470 | .625 | .470 | .492 | .470 | .970 | .702 |
| 8 | .756 | .572 | .756 | .572 | .591 | .572 | .989 | .756 |
| 9 | .799 | .613 | .799 | .613 | .603 | .612 | 1.040 | .804 |
| 10 | .838 | .606 | .838 | .606 | .581 | .605 | 1.074 | .985 |
| 11 | .858 | .563 | .858 | .563 | .573 | .563 | 1.020 | 1.043 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | -4.2 | -10.2 | 14.6 | .398 | .000 | .069 | .069 | .026 | .026 |
| 2 | 10.00 | -5.3 | -11.2 | 11.7 | .377 | .000 | .044 | .044 | .016 | .016 |
| 3 | 20.00 | -5.8 | -11.7 | 8.5 | .365 | .000 | .040 | .040 | .014 | .014 |
| 4 | 30.00 | -4.2 | -10.0 | 7.9 | .372 | .000 | .038 | .038 | .013 | .013 |
| 5 | 36.00 | -2.1 | -7.9 | 7.8 | .390 | .000 | .043 | .043 | .014 | .014 |
| 6 | 42.00 | -.3 | -6.1 | 6.5 | .415 | .000 | .043 | .043 | .014 | .014 |
| 7 | 50.00 | -.3 | -5.9 | 6.9 | .423 | .000 | .069 | .069 | .020 | .020 |
| 8 | 70.00 | -3.3 | -8.8 | 8.9 | .384 | .000 | .070 | .070 | .018 | .018 |
| 9 | 80.00 | -3.3 | -8.6 | 9.9 | .367 | .000 | .052 | .052 | .013 | .013 |
| 10 | 90.00 | -1.2 | -6.3 | 12.7 | .405 | .000 | .097 | .097 | .022 | .022 |
| 11 | 95.00 | -.8 | -5.8 | 12.2 | .472 | .000 | .201 | .201 | .043 | .043 |

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(e) 80 Percent of design speed, reading 136

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 33.4 | .0 | 33.4 | .0 | 318.3 | 1.000 | 12.96 | .990 |
| 2 | 23.167 | 23.200 | 31.4 | -.3 | 31.4 | -.3 | 316.9 | 1.000 | 13.11 | .991 |
| 3 | 21.981 | 22.068 | 29.6 | -2.9 | 29.6 | -2.9 | 314.5 | 1.000 | 13.19 | .994 |
| 4 | 20.787 | 20.927 | 30.9 | -2.6 | 30.9 | -2.6 | 314.2 | 1.000 | 13.23 | .994 |
| 5 | 20.071 | 20.244 | 33.1 | -1.5 | 33.1 | -1.5 | 314.8 | 1.000 | 13.21 | .993 |
| 6 | 19.350 | 19.558 | 35.6 | -.8 | 35.6 | -.8 | 315.5 | 1.000 | 13.17 | .993 |
| 7 | 18.387 | 18.649 | 37.6 | -.2 | 37.6 | -.2 | 316.1 | 1.000 | 13.22 | .993 |
| 8 | 15.961 | 16.388 | 39.4 | -.7 | 39.4 | -.7 | 316.0 | 1.000 | 13.72 | .990 |
| 9 | 14.732 | 15.263 | 41.8 | -.6 | 41.8 | -.6 | 316.7 | 1.000 | 13.89 | .988 |
| 10 | 13.492 | 14.143 | 46.7 | 1.1 | 46.7 | 1.1 | 319.0 | 1.000 | 14.19 | .976 |
| 11 | 12.868 | 13.586 | 49.0 | -1.1 | 49.0 | -1.1 | 319.4 | 1.000 | 14.21 | .945 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 172.0 | 136.5 | 172.0 | 136.5 | 143.7 | 136.5 | 94.6 | .1 | .0 | .0 |
| 2 | 178.3 | 144.3 | 178.3 | 144.3 | 152.2 | 144.3 | 92.8 | -.7 | .0 | .0 |
| 3 | 183.5 | 151.4 | 183.5 | 151.4 | 159.5 | 151.2 | 90.7 | -7.7 | .0 | .0 |
| 4 | 185.3 | 153.1 | 185.3 | 153.1 | 158.9 | 152.9 | 95.2 | -6.8 | .0 | .0 |
| 5 | 185.8 | 152.6 | 185.8 | 152.6 | 155.7 | 152.6 | 101.5 | -4.1 | .0 | .0 |
| 6 | 186.4 | 151.8 | 186.4 | 151.8 | 151.5 | 151.8 | 108.5 | -2.1 | .0 | .0 |
| 7 | 191.1 | 154.3 | 191.1 | 154.3 | 151.3 | 154.3 | 116.7 | -.6 | .0 | .0 |
| 8 | 210.5 | 167.7 | 210.5 | 167.7 | 162.8 | 167.7 | 133.5 | -2.0 | .0 | .0 |
| 9 | 223.3 | 177.7 | 223.3 | 177.7 | 166.4 | 177.7 | 149.0 | -2.0 | .0 | .0 |
| 10 | 239.4 | 181.1 | 239.4 | 181.1 | 164.2 | 181.1 | 174.1 | 3.6 | .0 | .0 |
| 11 | 245.0 | 168.3 | 245.0 | 168.3 | 160.8 | 168.3 | 184.8 | -3.2 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK CS VEL R | MERID PEAK CS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .492 | .387 | .492 | .387 | .411 | .387 | .950 | .562 |
| 2 | .512 | .411 | .512 | .411 | .437 | .411 | .949 | .512 |
| 3 | .530 | .434 | .530 | .434 | .461 | .433 | .948 | .530 |
| 4 | .536 | .439 | .536 | .439 | .460 | .439 | .962 | .536 |
| 5 | .537 | .437 | .537 | .437 | .450 | .437 | .980 | .537 |
| 6 | .538 | .434 | .538 | .434 | .438 | .434 | 1.002 | .589 |
| 7 | .552 | .441 | .552 | .441 | .437 | .441 | 1.020 | .633 |
| 8 | .613 | .481 | .613 | .481 | .474 | .481 | 1.030 | .668 |
| 9 | .652 | .511 | .652 | .511 | .486 | .511 | 1.068 | .732 |
| 10 | .701 | .519 | .701 | .519 | .481 | .519 | 1.102 | .868 |
| 11 | .718 | .481 | .718 | .481 | .471 | .480 | 1.047 | .923 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | -1.7 | -7.6 | 14.1 | .417 | .000 | .065 | .065 | .025 | .025 |
| 2 | 10.00 | -3.4 | -9.4 | 11.8 | .386 | .000 | .052 | .052 | .020 | .020 |
| 3 | 20.00 | -5.2 | -11.1 | 7.3 | .365 | .000 | .036 | .036 | .013 | .013 |
| 4 | 30.00 | -4.1 | -10.0 | 6.9 | .358 | .000 | .031 | .031 | .010 | .010 |
| 5 | 36.00 | -2.4 | -8.2 | 7.6 | .363 | .000 | .037 | .037 | .012 | .012 |
| 6 | 42.00 | -.7 | -6.4 | 8.2 | .371 | .000 | .039 | .039 | .012 | .012 |
| 7 | 50.00 | .2 | -5.4 | 8.6 | .375 | .000 | .040 | .040 | .012 | .012 |
| 8 | 70.00 | -1.6 | -7.0 | 8.4 | .369 | .000 | .043 | .043 | .011 | .011 |
| 9 | 80.00 | -1.5 | -6.9 | 9.3 | .364 | .000 | .047 | .047 | .011 | .011 |
| 10 | 90.00 | .4 | -4.8 | 13.0 | .398 | .000 | .086 | .086 | .019 | .019 |
| 11 | 95.00 | 1.1 | -4.0 | 12.2 | .471 | .000 | .189 | .189 | .040 | .040 |

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(f) 80 Percent of design speed; reading 159

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 40.2 | 1.8 | 40.2 | 1.8 | 323.2 | 1.000 | 13.53 | .990 |
| 2 | 23.167 | 23.200 | 38.4 | 1.1 | 38.4 | 1.1 | 321.5 | 1.000 | 13.57 | .991 |
| 3 | 21.981 | 22.068 | 36.0 | -1.8 | 36.0 | -1.8 | 318.3 | 1.000 | 13.60 | .993 |
| 4 | 20.787 | 20.927 | 37.7 | -2.2 | 37.7 | -2.2 | 317.8 | 1.000 | 13.54 | .995 |
| 5 | 20.071 | 20.243 | 40.2 | -.5 | 40.2 | -.5 | 318.4 | 1.000 | 13.55 | .994 |
| 6 | 19.350 | 19.553 | 42.2 | .2 | 42.2 | .2 | 319.0 | 1.000 | 13.54 | .991 |
| 7 | 18.387 | 18.649 | 43.8 | .9 | 43.8 | .9 | 319.3 | 1.000 | 13.60 | .990 |
| 8 | 15.961 | 16.388 | 43.9 | -.5 | 43.9 | -.5 | 317.5 | 1.000 | 13.82 | .991 |
| 9 | 14.732 | 15.263 | 45.4 | .6 | 45.4 | .6 | 317.8 | 1.000 | 13.99 | .988 |
| 10 | 13.492 | 14.143 | 50.1 | 3.8 | 50.1 | 3.8 | 319.6 | 1.000 | 14.25 | .970 |
| 11 | 12.868 | 13.586 | 52.7 | -.7 | 52.7 | -.7 | 319.9 | 1.000 | 14.15 | .946 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 170.0 | 129.6 | 170.0 | 129.6 | 129.9 | 129.5 | 109.6 | 4.0 | .0 | .0 |
| 2 | 172.5 | 132.3 | 172.5 | 132.3 | 135.2 | 132.3 | 107.2 | 2.4 | .0 | .0 |
| 3 | 174.4 | 135.0 | 174.4 | 135.0 | 141.0 | 134.9 | 102.6 | -4.4 | .0 | .0 |
| 4 | 175.4 | 135.1 | 175.4 | 135.1 | 138.8 | 135.0 | 107.3 | -5.1 | .0 | .0 |
| 5 | 177.3 | 134.6 | 177.3 | 134.6 | 135.5 | 134.6 | 114.3 | -1.2 | .0 | .0 |
| 6 | 179.8 | 134.0 | 179.8 | 134.0 | 133.2 | 134.0 | 120.8 | .5 | .0 | .0 |
| 7 | 185.6 | 135.5 | 185.6 | 135.5 | 134.0 | 135.4 | 128.4 | 2.1 | .0 | .0 |
| 8 | 202.2 | 145.5 | 202.2 | 145.5 | 145.7 | 145.5 | 140.2 | -1.3 | .0 | .0 |
| 9 | 215.4 | 153.7 | 215.4 | 153.7 | 151.3 | 153.7 | 153.4 | 1.6 | .0 | .0 |
| 10 | 231.6 | 152.2 | 231.6 | 152.2 | 148.5 | 151.8 | 177.7 | 10.1 | .0 | .0 |
| 11 | 235.2 | 133.6 | 235.2 | 133.6 | 142.4 | 133.5 | 187.1 | -1.5 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .483 | .364 | .483 | .364 | .369 | .364 | .997 | .675 |
| 2 | .491 | .373 | .491 | .373 | .385 | .373 | .979 | .648 |
| 3 | .500 | .383 | .500 | .383 | .404 | .383 | .957 | .599 |
| 4 | .503 | .384 | .503 | .384 | .398 | .383 | .973 | .623 |
| 5 | .508 | .382 | .508 | .382 | .388 | .382 | .994 | .665 |
| 6 | .515 | .380 | .515 | .380 | .382 | .380 | 1.006 | .701 |
| 7 | .533 | .384 | .533 | .384 | .385 | .384 | 1.011 | .735 |
| 8 | .585 | .414 | .585 | .414 | .422 | .414 | .998 | .750 |
| 9 | .626 | .438 | .626 | .438 | .440 | .438 | 1.016 | .795 |
| 10 | .675 | .432 | .675 | .432 | .433 | .431 | 1.022 | .921 |
| 11 | .686 | .378 | .686 | .378 | .416 | .378 | .938 | .973 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 5.1 | -.8 | 15.9 | .476 | .000 | .066 | .066 | .025 | .025 |
| 2 | 10.00 | 3.6 | -2.3 | 13.1 | .460 | .000 | .058 | .058 | .022 | .022 |
| 3 | 20.00 | 1.3 | -4.6 | 8.4 | .443 | .000 | .042 | .042 | .015 | .015 |
| 4 | 30.00 | 2.7 | -3.2 | 7.3 | .445 | .000 | .030 | .030 | .010 | .010 |
| 5 | 36.00 | 4.6 | -1.2 | 8.6 | .451 | .000 | .036 | .036 | .012 | .012 |
| 6 | 42.00 | 5.9 | .2 | 9.2 | .464 | .000 | .052 | .052 | .016 | .016 |
| 7 | 50.00 | 6.4 | .7 | 9.7 | .472 | .000 | .058 | .058 | .017 | .017 |
| 8 | 70.00 | 2.9 | -2.5 | 8.6 | .460 | .000 | .045 | .045 | .012 | .012 |
| 9 | 80.00 | 2.0 | -3.3 | 10.5 | .453 | .000 | .052 | .052 | .013 | .013 |
| 10 | 90.00 | 3.8 | -1.4 | 15.6 | .499 | .000 | .115 | .115 | .025 | .025 |
| 11 | 95.00 | 4.8 | -.2 | 12.7 | .598 | .000 | .198 | .198 | .042 | .042 |

TABLE VII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(g) 80 Percent of design speed; reading 172

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 49.8 | 3.1 | 49.8 | 3.1 | 328.8 | 1.000 | 13.91 | .987 |
| 2 | 23.167 | 23.200 | 49.8 | 2.8 | 49.8 | 2.8 | 327.8 | 1.000 | 13.90 | .986 |
| 3 | 21.981 | 22.068 | 48.7 | 4.1 | 48.7 | 4.1 | 325.5 | 1.000 | 13.89 | .985 |
| 4 | 20.787 | 20.927 | 49.0 | 1.9 | 49.0 | 1.9 | 324.0 | 1.000 | 13.86 | .981 |
| 5 | 20.071 | 20.244 | 50.3 | .7 | 50.3 | .7 | 323.6 | 1.000 | 13.82 | .981 |
| 6 | 19.350 | 19.558 | 51.4 | -1.2 | 51.4 | -1.2 | 323.4 | 1.000 | 13.78 | .980 |
| 7 | 18.387 | 18.649 | 51.8 | -.7 | 51.8 | -.7 | 323.0 | 1.000 | 13.78 | .982 |
| 8 | 15.961 | 16.388 | 48.4 | 3.1 | 48.4 | 3.1 | 319.3 | 1.000 | 13.86 | .981 |
| 9 | 14.732 | 15.263 | 48.3 | 4.7 | 48.3 | 4.7 | 319.2 | 1.000 | 14.11 | .976 |
| 10 | 13.492 | 14.143 | 51.9 | 7.6 | 51.9 | 7.6 | 319.7 | 1.000 | 14.21 | .960 |
| 11 | 12.868 | 13.586 | 55.4 | .7 | 55.4 | .7 | 320.1 | 1.000 | 14.03 | .954 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 164.9 | 119.9 | 164.9 | 119.9 | 106.4 | 119.7 | 126.0 | 6.4 | .0 | .0 |
| 2 | 166.2 | 119.0 | 166.2 | 119.0 | 107.4 | 118.8 | 126.9 | 5.8 | .0 | .0 |
| 3 | 169.2 | 117.3 | 169.2 | 117.3 | 111.8 | 117.0 | 127.1 | 8.5 | .0 | .0 |
| 4 | 172.0 | 113.8 | 172.0 | 113.8 | 113.0 | 113.8 | 129.8 | 3.7 | .0 | .0 |
| 5 | 173.6 | 111.2 | 173.6 | 111.2 | 111.0 | 111.2 | 133.5 | 1.5 | .0 | .0 |
| 6 | 175.8 | 109.5 | 175.8 | 109.5 | 109.8 | 109.5 | 137.3 | -2.2 | .0 | .0 |
| 7 | 180.8 | 109.6 | 180.8 | 109.6 | 111.9 | 109.6 | 142.1 | -1.3 | .0 | .0 |
| 8 | 198.0 | 121.0 | 198.0 | 121.0 | 131.6 | 120.8 | 148.0 | 6.6 | .0 | .0 |
| 9 | 214.1 | 128.7 | 214.1 | 128.7 | 142.5 | 128.3 | 159.8 | 10.6 | .0 | .0 |
| 10 | 226.2 | 124.8 | 226.2 | 124.8 | 139.4 | 123.7 | 178.1 | 16.4 | .0 | .0 |
| 11 | 228.1 | 110.8 | 228.1 | 110.8 | 129.4 | 110.8 | 187.9 | 1.4 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .463 | .334 | .463 | .334 | .299 | .333 | 1.125 | .797 |
| 2 | .468 | .331 | .468 | .331 | .302 | .331 | 1.106 | .795 |
| 3 | .479 | .328 | .479 | .328 | .316 | .327 | 1.047 | .782 |
| 4 | .488 | .319 | .488 | .319 | .320 | .319 | 1.007 | .791 |
| 5 | .493 | .311 | .493 | .311 | .315 | .311 | 1.002 | .812 |
| 6 | .500 | .307 | .500 | .307 | .312 | .307 | .997 | .831 |
| 7 | .515 | .307 | .515 | .307 | .319 | .307 | .980 | .847 |
| 8 | .571 | .342 | .571 | .342 | .379 | .341 | .918 | .817 |
| 9 | .620 | .364 | .620 | .364 | .413 | .363 | .900 | .847 |
| 10 | .658 | .352 | .658 | .352 | .406 | .349 | .887 | .934 |
| 11 | .663 | .312 | .663 | .312 | .376 | .312 | .856 | .997 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 14.6 | 8.6 | 16.9 | .551 | .000 | .097 | .097 | .037 | .037 |
| 2 | 10.00 | 14.7 | 8.8 | 14.6 | .557 | .000 | .099 | .099 | .037 | .037 |
| 3 | 20.00 | 13.6 | 7.7 | 14.1 | .555 | .000 | .107 | .107 | .038 | .038 |
| 4 | 30.00 | 13.6 | 7.8 | 11.1 | .584 | .000 | .124 | .124 | .042 | .042 |
| 5 | 36.00 | 14.5 | 8.7 | 9.6 | .606 | .000 | .125 | .125 | .041 | .041 |
| 6 | 42.00 | 14.8 | 9.1 | 7.6 | .625 | .000 | .126 | .126 | .040 | .040 |
| 7 | 50.00 | 14.1 | 8.4 | 7.9 | .629 | .000 | .111 | .111 | .033 | .033 |
| 8 | 70.00 | 7.2 | 1.7 | 12.0 | .572 | .000 | .094 | .094 | .024 | .024 |
| 9 | 80.00 | 4.7 | -.7 | 14.4 | .563 | .000 | .103 | .103 | .025 | .025 |
| 10 | 90.00 | 5.4 | .2 | 19.1 | .602 | .000 | .160 | .160 | .035 | .035 |
| 11 | 95.00 | 7.3 | 2.3 | 13.8 | .683 | .000 | .182 | .182 | .039 | .039 |

TABLE VII. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR FIRST-STAGE STATOR

(h) 80 Percent of design speed; reading 183

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.757 | 23.762 | 44.8 | 2.0 | 44.8 | 2.0 | 326.3 | 1.000 | 13.82 | .989 |
| 2 | 23.167 | 23.200 | 44.3 | 2.2 | 44.3 | 2.2 | 324.9 | 1.000 | 13.81 | .990 |
| 3 | 21.981 | 22.068 | 43.0 | .7 | 43.0 | .7 | 322.2 | 1.000 | 13.78 | .990 |
| 4 | 20.787 | 20.927 | 44.4 | 1.0 | 44.4 | 1.0 | 321.4 | 1.000 | 13.76 | .988 |
| 5 | 20.071 | 20.244 | 46.1 | 1.5 | 46.1 | 1.5 | 321.6 | 1.000 | 13.74 | .986 |
| 6 | 19.350 | 19.558 | 47.8 | .8 | 47.8 | .8 | 321.7 | 1.000 | 13.71 | .985 |
| 7 | 18.387 | 18.649 | 48.8 | 1.6 | 48.8 | 1.6 | 321.5 | 1.000 | 13.74 | .985 |
| 8 | 15.961 | 16.388 | 46.6 | 1.7 | 46.6 | 1.7 | 318.7 | 1.000 | 13.85 | .988 |
| 9 | 14.732 | 15.263 | 47.1 | 3.1 | 47.1 | 3.1 | 318.7 | 1.000 | 14.11 | .981 |
| 10 | 13.492 | 14.143 | 51.1 | 6.5 | 51.1 | 6.5 | 319.6 | 1.000 | 14.21 | .962 |
| 11 | 12.868 | 13.586 | 54.5 | .4 | 54.5 | .4 | 320.1 | 1.000 | 14.05 | .952 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 167.8 | 125.3 | 167.8 | 125.3 | 119.1 | 125.2 | 118.1 | 4.3 | .0 | .0 |
| 2 | 168.9 | 125.5 | 168.9 | 125.5 | 120.9 | 125.4 | 117.9 | 4.8 | .0 | .0 |
| 3 | 169.7 | 124.4 | 169.7 | 124.4 | 124.1 | 124.4 | 115.7 | 1.5 | .0 | .0 |
| 4 | 172.5 | 122.2 | 172.5 | 122.2 | 123.3 | 122.2 | 120.6 | 2.2 | .0 | .0 |
| 5 | 174.2 | 120.3 | 174.2 | 120.3 | 120.7 | 120.2 | 125.6 | 3.1 | .0 | .0 |
| 6 | 176.5 | 118.7 | 176.5 | 118.7 | 118.5 | 118.7 | 130.8 | 1.7 | .0 | .0 |
| 7 | 181.9 | 120.0 | 181.9 | 120.0 | 119.8 | 119.9 | 136.9 | 3.3 | .0 | .0 |
| 8 | 200.3 | 132.2 | 200.3 | 132.2 | 137.5 | 132.2 | 145.5 | 3.9 | .0 | .0 |
| 9 | 215.6 | 139.0 | 215.6 | 139.0 | 146.8 | 138.8 | 157.9 | 7.4 | .0 | .0 |
| 10 | 228.1 | 134.5 | 228.1 | 134.5 | 143.1 | 133.6 | 177.6 | 15.3 | .0 | .0 |
| 11 | 230.4 | 119.7 | 230.4 | 119.7 | 133.7 | 119.7 | 187.6 | .8 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .474 | .350 | .474 | .350 | .336 | .350 | 1.051 | .733 |
| 2 | .478 | .352 | .478 | .352 | .342 | .351 | 1.037 | .723 |
| 3 | .482 | .350 | .482 | .350 | .353 | .350 | 1.003 | .696 |
| 4 | .491 | .344 | .491 | .344 | .351 | .344 | .991 | .720 |
| 5 | .496 | .338 | .496 | .338 | .344 | .338 | .996 | .748 |
| 6 | .503 | .334 | .503 | .334 | .338 | .334 | 1.002 | .777 |
| 7 | .520 | .338 | .520 | .338 | .342 | .338 | 1.001 | .802 |
| 8 | .578 | .375 | .578 | .375 | .397 | .375 | .961 | .793 |
| 9 | .626 | .394 | .626 | .394 | .426 | .394 | .945 | .827 |
| 10 | .664 | .381 | .664 | .381 | .417 | .378 | .934 | .924 |
| 11 | .671 | .338 | .671 | .338 | .389 | .338 | .895 | .987 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 9.5 | 3.5 | 15.8 | .513 | .000 | .075 | .075 | .029 | .029 |
| 2 | 10.00 | 9.2 | 3.3 | 14.0 | .507 | .000 | .069 | .069 | .026 | .026 |
| 3 | 20.00 | 8.0 | 2.1 | 10.6 | .505 | .000 | .067 | .067 | .024 | .024 |
| 4 | 30.00 | 9.0 | 3.2 | 10.3 | .522 | .000 | .079 | .079 | .027 | .027 |
| 5 | 36.00 | 10.4 | 4.6 | 10.4 | .537 | .000 | .088 | .088 | .029 | .029 |
| 6 | 42.00 | 11.3 | 5.5 | 9.6 | .555 | .000 | .096 | .096 | .030 | .030 |
| 7 | 50.00 | 11.1 | 5.5 | 10.1 | .558 | .000 | .087 | .087 | .026 | .026 |
| 8 | 70.00 | 5.4 | -.0 | 10.6 | .521 | .000 | .061 | .061 | .016 | .016 |
| 9 | 80.00 | 3.5 | -1.9 | 12.7 | .520 | .000 | .083 | .083 | .020 | .020 |
| 10 | 90.00 | 4.6 | -.6 | 18.1 | .564 | .000 | .147 | .147 | .032 | .032 |
| 11 | 95.00 | 6.4 | 1.4 | 13.4 | .648 | .000 | .184 | .184 | .039 | .039 |

TABLE VIII. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(a) 100 Percent of design speed; reading 123

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 2.9 | 45.7 | 65.0 | 55.2 | 349.0 | 1.169 | 16.00 | 1.568 |
| 2 | 23.002 | 22.708 | 2.1 | 45.6 | 64.0 | 54.2 | 346.2 | 1.170 | 16.06 | 1.566 |
| 3 | 21.951 | 21.742 | 2.0 | 46.1 | 62.3 | 51.8 | 341.9 | 1.167 | 16.14 | 1.552 |
| 4 | 20.899 | 20.780 | 1.8 | 46.0 | 61.6 | 49.4 | 339.7 | 1.161 | 16.06 | 1.557 |
| 5 | 20.272 | 20.206 | 1.6 | 45.7 | 62.1 | 47.6 | 339.1 | 1.158 | 15.83 | 1.574 |
| 6 | 19.647 | 19.637 | -.2 | 44.9 | 62.9 | 46.3 | 338.4 | 1.156 | 15.57 | 1.589 |
| 7 | 18.814 | 18.887 | -.4 | 46.0 | 62.6 | 44.2 | 337.4 | 1.154 | 15.53 | 1.576 |
| 8 | 16.721 | 17.071 | .8 | 49.2 | 58.4 | 35.0 | 334.7 | 1.150 | 15.80 | 1.536 |
| 9 | 15.651 | 16.198 | 2.5 | 52.4 | 56.9 | 27.8 | 335.0 | 1.150 | 15.96 | 1.523 |
| 10 | 14.536 | 15.352 | 6.1 | 55.4 | 56.1 | 17.3 | 336.4 | 1.150 | 15.71 | 1.529 |
| 11 | 13.952 | 14.938 | -.9 | 51.9 | 61.8 | 16.8 | 337.0 | 1.152 | 15.20 | 1.555 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 181.0 | 226.7 | 427.1 | 277.7 | 180.7 | 158.4 | 9.1 | 162.2 | 396.1 | 390.3 |
| 2 | 185.3 | 226.9 | 423.0 | 271.2 | 185.1 | 158.7 | 6.8 | 162.2 | 387.2 | 382.2 |
| 3 | 190.0 | 228.0 | 408.6 | 255.4 | 189.9 | 158.1 | 6.7 | 164.4 | 368.5 | 365.0 |
| 4 | 186.6 | 228.2 | 392.2 | 243.3 | 186.5 | 158.4 | 5.8 | 164.2 | 350.8 | 348.8 |
| 5 | 178.1 | 229.0 | 379.9 | 237.5 | 178.0 | 160.0 | 5.0 | 163.9 | 340.5 | 339.4 |
| 6 | 168.7 | 227.6 | 370.9 | 233.4 | 168.7 | 161.1 | -.5 | 160.7 | 329.7 | 329.6 |
| 7 | 164.6 | 228.0 | 358.2 | 221.2 | 164.6 | 158.5 | -1.2 | 163.9 | 317.0 | 318.2 |
| 8 | 171.6 | 236.4 | 327.5 | 188.5 | 171.5 | 154.4 | 2.3 | 179.0 | 281.3 | 287.2 |
| 9 | 172.6 | 244.7 | 308.6 | 168.7 | 172.5 | 149.2 | 7.5 | 193.9 | 263.5 | 272.7 |
| 10 | 154.3 | 258.4 | 275.0 | 153.8 | 153.4 | 146.8 | 16.4 | 212.6 | 244.7 | 258.4 |
| 11 | 127.3 | 258.3 | 269.1 | 166.3 | 127.3 | 159.2 | -2.1 | 203.4 | 235.0 | 251.5 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .495 | .579 | 1.168 | .709 | .494 | .434 | .876 | 1.367 |
| 2 | .510 | .582 | 1.163 | .695 | .509 | .407 | .857 | 1.353 |
| 3 | .527 | .589 | 1.133 | .660 | .527 | .409 | .832 | 1.325 |
| 4 | .519 | .593 | 1.090 | .633 | .518 | .412 | .850 | 1.329 |
| 5 | .494 | .597 | 1.054 | .619 | .494 | .417 | .899 | 1.358 |
| 6 | .468 | .594 | 1.028 | .609 | .468 | .421 | .955 | 1.410 |
| 7 | .456 | .597 | .993 | .579 | .456 | .415 | .963 | 1.427 |
| 8 | .478 | .624 | .913 | .490 | .478 | .408 | .900 | 1.280 |
| 9 | .481 | .648 | .861 | .447 | .481 | .395 | .865 | 1.184 |
| 10 | .427 | .686 | .762 | .408 | .425 | .390 | .957 | 1.092 |
| 11 | .350 | .684 | .740 | .441 | .350 | .422 | 1.250 | 1.220 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 3.0 | .5 | .9 | .484 | .809 | .161 | .134 | .035 | .029 |
| 2 | 10.00 | 3.0 | .5 | .6 | .494 | .804 | .167 | .142 | .036 | .031 |
| 3 | 20.00 | 2.9 | .2 | .4 | .511 | .800 | .174 | .156 | .038 | .034 |
| 4 | 30.00 | 3.9 | .9 | .7 | .516 | .834 | .149 | .133 | .033 | .029 |
| 5 | 36.00 | 5.5 | 2.1 | .9 | .512 | .875 | .116 | .100 | .026 | .022 |
| 6 | 42.00 | 7.4 | 3.7 | 1.8 | .509 | .906 | .090 | .071 | .020 | .016 |
| 7 | 50.00 | 8.5 | 4.3 | 3.1 | .524 | .900 | .099 | .081 | .022 | .018 |
| 8 | 70.00 | 7.1 | 1.9 | 5.1 | .574 | .867 | .145 | .143 | .033 | .032 |
| 9 | 80.00 | 5.3 | -.1 | 5.7 | .611 | .848 | .182 | .182 | .041 | .041 |
| 10 | 90.00 | 4.6 | -.7 | 5.6 | .618 | .860 | .203 | .203 | .046 | .046 |
| 11 | 95.00 | 8.9 | 4.0 | 11.6 | .564 | .885 | .177 | .177 | .039 | .039 |

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(b) 100 Percent of design speed; reading 1140

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 1.4 | 40.6 | 63.8 | 56.0 | 337.7 | 1.157 | 14.75 | 1.523 |
| 2 | 23.002 | 22.708 | .6 | 40.6 | 62.3 | 55.0 | 335.5 | 1.158 | 14.93 | 1.510 |
| 3 | 21.951 | 21.742 | -.6 | 39.4 | 60.5 | 53.1 | 332.6 | 1.153 | 15.07 | 1.501 |
| 4 | 20.899 | 20.780 | -.4 | 39.8 | 59.9 | 51.0 | 331.8 | 1.147 | 14.92 | 1.510 |
| 5 | 20.272 | 20.206 | -.3 | 40.36 | 0.5 | 49.5 | 331.6 | 1.145 | 14.61 | 1.539 |
| 6 | 19.647 | 19.637 | -1.4 | 39.9 | 61.5 | 47.8 | 331.2 | 1.144 | 14.31 | 1.570 |
| 7 | 18.814 | 18.887 | -1.2 | 39.5 | 60.1 | 44.2 | 331.6 | 1.141 | 14.37 | 1.579 |
| 8 | 16.721 | 17.071 | .4 | 40.1 | 52.6 | 33.9 | 332.3 | 1.134 | 15.73 | 1.481 |
| 9 | 15.651 | 16.198 | .6 | 41.7 | 50.0 | 28.0 | 332.9 | 1.136 | 16.02 | 1.456 |
| 10 | 14.536 | 15.352 | 1.7 | 42.9 | 50.2 | 20.9 | 335.1 | 1.134 | 15.81 | 1.473 |
| 11 | 13.952 | 14.938 | -.6 | 42.0 | 54.1 | 18.9 | 335.5 | 1.135 | 15.17 | 1.518 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 191.7 | 218.9 | 434.5 | 297.0 | 191.7 | 166.2 | 4.6 | 142.6 | 394.5 | 388.7 |
| 2 | 201.4 | 219.3 | 433.1 | 290.4 | 201.4 | 166.5 | 2.1 | 142.7 | 385.5 | 380.6 |
| 3 | 209.6 | 219.2 | 425.4 | 281.9 | 209.6 | 169.3 | -2.1 | 139.2 | 368.1 | 364.6 |
| 4 | 203.8 | 219.2 | 406.4 | 267.6 | 203.7 | 168.4 | -1.5 | 140.3 | 350.2 | 348.2 |
| 5 | 192.5 | 220.0 | 391.2 | 258.1 | 192.5 | 167.7 | -1.0 | 142.4 | 339.6 | 338.5 |
| 6 | 181.6 | 221.5 | 380.2 | 252.8 | 181.6 | 169.8 | -4.4 | 142.2 | 329.7 | 329.5 |
| 7 | 183.3 | 228.3 | 367.9 | 245.4 | 183.3 | 176.0 | -4.0 | 145.4 | 315.1 | 316.3 |
| 8 | 213.0 | 246.7 | 350.7 | 227.5 | 213.0 | 188.7 | 1.5 | 158.9 | 280.1 | 286.0 |
| 9 | 218.5 | 256.0 | 340.0 | 216.7 | 218.5 | 191.3 | 2.3 | 170.2 | 262.7 | 271.9 |
| 10 | 198.1 | 267.6 | 309.1 | 209.6 | 198.0 | 195.9 | 5.9 | 182.3 | 243.3 | 257.0 |
| 11 | 170.4 | 270.9 | 290.7 | 212.7 | 170.4 | 201.2 | -1.8 | 181.4 | 233.7 | 250.2 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .535 | .571 | 1.213 | .774 | .535 | .433 | .867 | 1.364 |
| 2 | .566 | .573 | 1.217 | .759 | .566 | .435 | .827 | 1.337 |
| 3 | .593 | .577 | 1.204 | .742 | .593 | .446 | .808 | 1.319 |
| 4 | .576 | .579 | 1.150 | .707 | .576 | .445 | .827 | 1.312 |
| 5 | .543 | .583 | 1.103 | .683 | .543 | .444 | .871 | 1.334 |
| 6 | .511 | .587 | 1.069 | .670 | .511 | .450 | .935 | 1.379 |
| 7 | .515 | .607 | 1.035 | .653 | .515 | .468 | .961 | 1.359 |
| 8 | .604 | .662 | .994 | .610 | .604 | .506 | .886 | 1.179 |
| 9 | .620 | .688 | .965 | .582 | .620 | .514 | .875 | 1.105 |
| 10 | .556 | .720 | .868 | .564 | .556 | .527 | .989 | 1.059 |
| 11 | .475 | .729 | .810 | .572 | .475 | .541 | 1.181 | 1.123 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT P | LOSS COEFF ROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 1.9 | -.6 | 1.7 | .436 | .812 | .143 | .112 | .030 | .024 |
| 2 | 10.00 | 1.2 | -1.3 | 1.4 | .449 | .790 | .160 | .131 | .034 | .028 |
| 3 | 20.00 | 1.1 | -1.6 | 1.7 | .454 | .801 | .151 | .126 | .032 | .027 |
| 4 | 30.00 | 2.2 | -.8 | 2.3 | .459 | .846 | .120 | .101 | .026 | .022 |
| 5 | 36.00 | 3.9 | .6 | 2.7 | 461 | .901 | .081 | .064 | .017 | .014 |
| 6 | 42.00 | 6.0 | 2.3 | 3.2 | .458 | .952 | .041 | .022 | .009 | .005 |
| 7 | 50.00 | 6.0 | 1.8 | 3.0 | .457 | .984 | .014 | -.000 | .003 | -.000 |
| 8 | 70.00 | 1.3 | -3.9 | 4.0 | .475 | .883 | .104 | .102 | .024 | .023 |
| 9 | 80.00 | -.7 | -6.1 | 5.9 | .492 | .833 | .155 | .155 | .035 | 035 |
| 10 | 90.00 | -1.4 | -6.6 | 9.2 | .463 | .870 | .141 | .141 | .032 | .032 |
| 11 | 95.00 | 1.3 | -3.7 | 13.7 | .419 | .935 | .080 | .080 | .017 | .017 |

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(c) 100 Percent of design speed; reading 1157

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 2.4 | 42.7 | 63.7 | 55.4 | 341.4 | 1.162 | 15.22 | 1.541 |
| 2 | 23.002 | 22.708 | 1.5 | 42.9 | 62.4 | 54.5 | 339.1 | 1.163 | 15.37 | 1.527 |
| 3 | 21.951 | 21.742 | .0 | 42.2 | 60.9 | 52.5 | 335.5 | 1.161 | 15.46 | 1.524 |
| 4 | 20.899 | 20.780 | .3 | 42.3 | 60.3 | 50.3 | 334.2 | 1.154 | 15.28 | 1.531 |
| 5 | 20.272 | 20.206 | .5 | 42.7 | 61.0 | 48.9 | 333.9 | 1.150 | 14.98 | 1.555 |
| 6 | 19.647 | 19.637 | -.9 | 41.9 | 61.9 | 47.1 | 333.5 | 1.149 | 14.68 | 1.586 |
| 7 | 18.814 | 18.887 | -1.1 | 41.2 | 60.9 | 43.8 | 333.3 | 1.145 | 14.73 | 1.589 |
| 8 | 16.721 | 17.071 | .6 | 42.2 | 54.2 | 34.5 | 332.9 | 1.137 | 15.82 | 1.504 |
| 9 | 15.651 | 16.198 | .6 | 44.3 | 51.8 | 28.2 | 333.1 | 1.140 | 16.02 | 1.478 |
| 10 | 14.536 | 15.352 | 2.6 | 46.3 | 51.9 | 20.7 | 335.3 | 1.138 | 15.85 | 1.493 |
| 11 | 13.952 | 14.938 | -.4 | 45.5 | 56.4 | 19.2 | 335.8 | 1.139 | 15.22 | 1.526 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 191.5 | 223.8 | 432.6 | 289.6 | 191.3 | 164.5 | 8.0 | 151.8 | 396.0 | 390.1 |
| 2 | 199.7 | 223.2 | 430.2 | 281.6 | 199.6 | 163.4 | 5.2 | 152.1 | 386.3 | 381.4 |
| 3 | 205.8 | 223.7 | 422.8 | 272.1 | 205.8 | 165.9 | .1 | 150.1 | 369.4 | 365.9 |
| 4 | 199.1 | 222.8 | 402.2 | 258.1 | 199.1 | 164.8 | 1.1 | 149.9 | 350.5 | 348.5 |
| 5 | 188.0 | 223.2 | 387.4 | 249.5 | 188.0 | 164.2 | 1.6 | 151.3 | 340.3 | 339.2 |
| 6 | 177.2 | 224.4 | 376.6 | 245.2 | 177.1 | 167.0 | -2.8 | 149.9 | 329.5 | 329.3 |
| 7 | 177.6 | 229.6 | 364.9 | 239.2 | 177.6 | 172.8 | -3.3 | 151.2 | 315.5 | 316.7 |
| 8 | 200.5 | 242.7 | 343.2 | 218.2 | 200.5 | 180.0 | 1.9 | 162.9 | 280.5 | 286.4 |
| 9 | 204.3 | 250.8 | 330.7 | 203.7 | 204.3 | 179.5 | 2.3 | 175.2 | 262.3 | 271.5 |
| 10 | 184.7 | 261.6 | 299.1 | 193.1 | 184.5 | 180.7 | 8.3 | 189.2 | 243.7 | 257.4 |
| 11 | 156.4 | 261.4 | 282.4 | 193.9 | 156.4 | 183.1 | -1.2 | 186.6 | 234.0 | 250.5 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .532 | .580 | 1.201 | .750 | .531 | .426 | .860 | 1.351 |
| 2 | .558 | .580 | 1.201 | .731 | .558 | .424 | .819 | 1.325 |
| 3 | .579 | .585 | 1.190 | .711 | .579 | .434 | .806 | 1.321 |
| 4 | .560 | .586 | 1.132 | .678 | .560 | .433 | .828 | 1.313 |
| 5 | .528 | .588 | 1.087 | .657 | .528 | .432 | .873 | 1.339 |
| 6 | .496 | .592 | 1.054 | .647 | .496 | .441 | .943 | 1.387 |
| 7 | .497 | .608 | 1.022 | .633 | .497 | .457 | .973 | 1.380 |
| 8 | .566 | .648 | .968 | .583 | .566 | .481 | .897 | 1.211 |
| 9 | .577 | .671 | .934 | .545 | .577 | .480 | .878 | 1.142 |
| 10 | .517 | .701 | .837 | .517 | .516 | .484 | .979 | 1.076 |
| 11 | .434 | .699 | .783 | .519 | .434 | .490 | 1.171 | 1.148 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 1.8 | -.7 | 1.1 | .455 | .810 | .150 | .122 | .032 | .026 |
| 2 | 10.00 | 1.3 | -1.2 | 1.0 | .471 | .786 | .170 | .145 | .037 | .031 |
| 3 | 20.00 | 1.4 | -1.2 | 1.1 | .481 | .790 | .168 | .144 | .036 | .031 |
| 4 | 30.00 | 2.7 | -.4 | 1.6 | .483 | .840 | .132 | .114 | .028 | .025 |
| 5 | 36.00 | 4.4 | 1.0 | 2.1 | .483 | .891 | .093 | .077 | .020 | .017 |
| 6 | 42.00 | 6.4 | 2.7 | 2.5 | .478 | .941 | .053 | .034 | .011 | .007 |
| 7 | 50.00 | 6.7 | 2.6 | 2.6 | .474 | .970 | .027 | .012 | .006 | .003 |
| 8 | 70.00 | 2.9 | -2.3 | 4.5 | .494 | .899 | .094 | .093 | .021 | .021 |
| 9 | 80.00 | 1.1 | -4.3 | 6.1 | .521 | .843 | .157 | .157 | .036 | .036 |
| 10 | 90.00 | .4 | -4.9 | 9.0 | .504 | .877 | .145 | .145 | .033 | .033 |
| 11 | 95.00 | 3.5 | -1.4 | 14.0 | .472 | .922 | .103 | .103 | .022 | .022 |

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(d) 100 Percent of design speed; reading 1168

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 1.4 | 35.0 | 63.6 | 57.4 | 336.5 | 1.133 | 14.60 | 1.385 |
| 2 | 23.002 | 22.708 | .6 | 34.1 | 62.2 | 55.8 | 334.5 | 1.133 | 14.77 | 1.388 |
| 3 | 21.951 | 21.742 | -.7 | 32.0 | 60.3 | 53.5 | 331.6 | 1.129 | 14.91 | 1.399 |
| 4 | 20.899 | 20.780 | -.6 | 32.4 | 59.8 | 51.5 | 331.0 | 1.125 | 14.76 | 1.410 |
| 5 | 20.272 | 20.206 | -.4 | 33.4 | 60.3 | 50.1 | 330.8 | 1.124 | 14.45 | 1.438 |
| 6 | 19.647 | 19.637 | -1.3 | 33.5 | 61.2 | 49.1 | 330.5 | 1.123 | 14.15 | 1.460 |
| 7 | 18.814 | 18.887 | -.9 | 34.3 | 59.7 | 46.7 | 331.1 | 1.120 | 14.23 | 1.451 |
| 8 | 16.721 | 17.071 | .6 | 36.3 | 51.8 | 35.6 | 332.2 | 1.122 | 15.68 | 1.372 |
| 9 | 15.651 | 16.198 | .9 | 37.7 | 49.0 | 27.7 | 333.0 | 1.129 | 16.03 | 1.388 |
| 10 | 14.536 | 15.352 | 1.8 | 39.3 | 49.3 | 19.3 | 335.2 | 1.133 | 15.76 | 1.443 |
| 11 | 13.952 | 14.938 | -.1 | 38.7 | 52.8 | 17.5 | 335.6 | 1.133 | 15.16 | 1.474 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 194.1 | 210.2 | 436.6 | 319.7 | 194.0 | 172.2 | 4.6 | 120.6 | 395.7 | 389.9 |
| 2 | 203.3 | 214.4 | 435.2 | 316.2 | 203.3 | 177.5 | 2.0 | 120.1 | 386.7 | 381.8 |
| 3 | 211.6 | 218.2 | 427.7 | 311.0 | 211.6 | 185.1 | -2.6 | 115.6 | 369.1 | 365.6 |
| 4 | 206.1 | 218.6 | 409.1 | 296.6 | 206.1 | 184.5 | -2.0 | 117.2 | 351.4 | 349.4 |
| 5 | 194.7 | 218.6 | 392.9 | 284.7 | 194.7 | 182.5 | -1.3 | 120.4 | 340.0 | 338.9 |
| 6 | 183.8 | 217.5 | 381.0 | 276.8 | 183.7 | 181.3 | -4.3 | 120.1 | 329.4 | 329.3 |
| 7 | 186.1 | 220.3 | 368.9 | 265.2 | 186.1 | 182.0 | -2.8 | 124.0 | 315.6 | 316.9 |
| 8 | 219.4 | 245.2 | 354.8 | 243.1 | 219.4 | 197.6 | 2.2 | 145.3 | 281.0 | 286.9 |
| 9 | 225.6 | 265.2 | 343.9 | 237.1 | 225.5 | 209.9 | 3.4 | 162.1 | 263.1 | 272.3 |
| 10 | 204.5 | 285.0 | 313.6 | 233.7 | 204.4 | 220.5 | 6.5 | 180.6 | 244.3 | 258.0 |
| 11 | 177.9 | 287.4 | 294.4 | 235.3 | 177.9 | 224.4 | -.4 | 179.7 | 234.1 | 250.6 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .543 | .554 | 1.222 | .842 | .543 | .454 | .888 | 1.365 |
| 2 | .572 | .567 | 1.225 | .836 | .572 | .469 | .873 | 1.340 |
| 3 | .600 | .582 | 1.213 | .829 | .600 | .493 | .875 | 1.323 |
| 4 | .584 | .585 | 1.160 | .793 | .584 | .493 | .895 | 1.315 |
| 5 | .550 | .585 | 1.110 | .762 | .550 | .488 | .938 | 1.331 |
| 6 | .518 | .582 | 1.073 | .741 | .518 | .485 | .987 | 1.371 |
| 7 | .524 | .590 | 1.039 | .711 | .524 | .488 | .978 | 1.346 |
| 8 | .624 | .661 | 1.008 | .655 | .623 | .533 | .900 | 1.153 |
| 9 | .642 | .717 | .978 | .641 | .642 | .568 | .931 | 1.075 |
| 10 | .575 | .772 | .882 | .633 | .575 | .597 | 1.079 | 1.046 |
| 11 | .496 | .779 | .821 | .638 | .496 | .608 | 1.261 | 1.102 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 1.7 | -.8 | 3.1 | .367 | .733 | .173 | .140 | .035 | .029 |
| 2 | 10.00 | 1.1 | -1.4 | 2.3 | .373 | .735 | .172 | .143 | .036 | .030 |
| 3 | 20.00 | .9 | -1.8 | 2.1 | .370 | .779 | .143 | .117 | .030 | .025 |
| 4 | 30.00 | 2.1 | -1.0 | 2.8 | .373 | .826 | .116 | .096 | .024 | .020 |
| 5 | 36.00 | 3.7 | .3 | 3.3 | .377 | .881 | .084 | .066 | .018 | .014 |
| 6 | 42.00 | 5.7 | 2.0 | 4.5 | .377 | .925 | .055 | .037 | .011 | .008 |
| 7 | 50.00 | 5.6 | 1.4 | 5.5 | .386 | .931 | .053 | .039 | .011 | .008 |
| 8 | 70.00 | .5 | -4.7 | 5.7 | .426 | .772 | .181 | .179 | .040 | .040 |
| 9 | 80.00 | -1.7 | -7.1 | 5.5 | .432 | .762 | .205 | .205 | .047 | .047 |
| 10 | 90.00 | -2.2 | -7.5 | 7.6 | .392 | .829 | .179 | .179 | .041 | .041 |
| 11 | 95.00 | -.1 | -5.0 | 12.3 | .347 | .877 | .145 | .145 | .032 | .032 |

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(e) 80 Percent of design speed; reading 136

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | .0 | 25.9 | 65.1 | 60.6 | 318.3 | 1.066 | 12.83 | 1.180 |
| 2 | 23.002 | 22.708 | -.3 | 24.8 | 63.1 | 57.3 | 316.9 | 1.068 | 13.00 | 1.198 |
| 3 | 21.951 | 21.742 | -2.6 | 22.1 | 61.1 | 54.4 | 314.5 | 1.068 | 13.11 | 1.210 |
| 4 | 20.899 | 20.780 | -2.3 | 22.6 | 59.5 | 52.2 | 314.2 | 1.067 | 13.15 | 1.216 |
| 5 | 20.272 | 20.206 | -1.4 | 23.9 | 58.5 | 50.6 | 314.8 | 1.066 | 13.12 | 1.221 |
| 6 | 19.647 | 19.637 | -.7 | 25.0 | 57.8 | 48.7 | 315.5 | 1.065 | 13.08 | 1.231 |
| 7 | 18.814 | 18.887 | -.2 | 26.3 | 56.2 | 45.2 | 316.1 | 1.068 | 13.12 | 1.244 |
| 8 | 16.721 | 17.071 | -.6 | 28.8 | 51.7 | 34.0 | 316.0 | 1.076 | 13.59 | 1.247 |
| 9 | 15.651 | 16.198 | -.6 | 31.0 | 49.1 | 26.5 | 316.7 | 1.083 | 13.73 | 1.272 |
| 10 | 14.536 | 15.352 | 1.1 | 34.1 | 47.9 | 17.3 | 319.0 | 1.089 | 13.85 | 1.289 |
| 11 | 13.952 | 14.938 | -1.2 | 33.2 | 51.7 | 15.0 | 319.4 | 1.092 | 13.43 | 1.334 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 147.4 | 153.9 | 350.2 | 282.0 | 147.4 | 138.4 | .1 | 67.3 | 317.7 | 313.1 |
| 2 | 158.2 | 167.0 | 349.1 | 280.8 | 158.2 | 151.6 | -.7 | 70.2 | 310.5 | 306.6 |
| 3 | 167.9 | 175.6 | 346.9 | 279.4 | 167.7 | 162.7 | -7.7 | 65.9 | 295.9 | 293.1 |
| 4 | 170.5 | 178.0 | 335.3 | 268.2 | 170.3 | 164.4 | -6.8 | 68.4 | 281.9 | 280.3 |
| 5 | 169.9 | 179.7 | 325.5 | 258.8 | 169.8 | 164.4 | -4.1 | 72.7 | 273.5 | 272.6 |
| 6 | 168.5 | 182.7 | 316.4 | 250.6 | 168.5 | 165.5 | -2.1 | 77.3 | 265.7 | 265.5 |
| 7 | 170.5 | 189.5 | 306.6 | 241.1 | 170.5 | 169.8 | -.6 | 84.0 | 254.2 | 255.2 |
| 8 | 179.8 | 214.7 | 290.0 | 226.9 | 179.8 | 188.2 | -2.0 | 103.5 | 225.6 | 230.3 |
| 9 | 184.2 | 231.2 | 281.4 | 221.6 | 184.2 | 198.2 | -1.9 | 119.1 | 210.8 | 218.1 |
| 10 | 173.6 | 252.4 | 259.0 | 219.1 | 173.6 | 209.1 | 3.5 | 141.3 | 195.6 | 206.6 |
| 11 | 151.1 | 261.1 | 243.9 | 226.3 | 151.0 | 218.6 | -3.2 | 142.9 | 188.3 | 201.6 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .419 | .424 | .996 | .778 | .419 | .381 | .939 | 1.265 |
| 2 | .452 | .463 | .998 | .778 | .452 | .420 | .958 | 1.215 |
| 3 | .483 | .489 | .998 | .779 | .483 | .453 | .970 | 1.202 |
| 4 | .491 | .497 | .966 | .749 | .491 | .459 | .965 | 1.164 |
| 5 | .489 | .502 | .937 | .722 | .489 | .459 | .968 | 1.131 |
| 6 | .484 | .510 | .909 | .699 | .484 | .462 | .982 | 1.106 |
| 7 | .490 | .529 | .881 | .673 | .490 | .474 | .996 | 1.059 |
| 8 | .518 | .602 | .835 | .636 | .518 | .527 | 1.046 | .958 |
| 9 | .531 | .649 | .811 | .621 | .531 | .556 | 1.076 | .894 |
| 10 | .497 | .709 | .741 | .615 | .497 | .587 | 1.205 | .831 |
| 11 | .429 | .734 | .693 | .637 | .429 | .615 | 1.447 | .903 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 3.2 | .7 | 6.3 | .267 | .737 | .117 | .112 | .022 | .021 |
| 2 | 10.00 | 2.0 | -.5 | 3.8 | .270 | .776 | .103 | .101 | .021 | .020 |
| 3 | 20.00 | 1.7 | -1.0 | 3.0 | .269 | .817 | .085 | .083 | .018 | .017 |
| 4 | 30.00 | 1.8 | -1.3 | 3.5 | .276 | .859 | .068 | .067 | .014 | .014 |
| 5 | 36.00 | 1.9 | -1.4 | 3.8 | .282 | .888 | .056 | .055 | .012 | .012 |
| 6 | 42.00 | 2.3 | -1.4 | 4.1 | .288 | .923 | .040 | .040 | .009 | .009 |
| 7 | 50.00 | 2.1 | -2.1 | 4.1 | .298 | .947 | .030 | .030 | .006 | .006 |
| 8 | 70.00 | .4 | -4.8 | 4.0 | .318 | .850 | .101 | .101 | .023 | .023 |
| 9 | 80.00 | -1.6 | -7.0 | 4.4 | .325 | .858 | .109 | .109 | .025 | .025 |
| 10 | 90.00 | -3.6 | -8.9 | 5.6 | .286 | .843 | .148 | .148 | .034 | .034 |
| 11 | 95.00 | -1.1 | -6.1 | 9.8 | .215 | .936 | .069 | .069 | .015 | .015 |

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(f) 80 Percent of design speed; reading 159

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 1.6 | 37.2 | 66.0 | 56.9 | 323.2 | 1.096 | 13.40 | 1.308 |
| 2 | 23.002 | 22.708 | 1.0 | 37.2 | 64.9 | 55.6 | 321.5 | 1.097 | 13.45 | 1.311 |
| 3 | 21.951 | 21.742 | -1.7 | 35.7 | 63.6 | 53.5 | 318.3 | 1.097 | 13.52 | 1.305 |
| 4 | 20.899 | 20.780 | -2.0 | 35.2 | 62.5 | 51.7 | 317.8 | 1.092 | 13.48 | 1.311 |
| 5 | 20.272 | 20.206 | -.5 | 36.3 | 61.5 | 49.9 | 318.4 | 1.090 | 13.47 | 1.313 |
| 6 | 19.647 | 19.637 | .2 | 37.0 | 60.8 | 48.0 | 319.0 | 1.088 | 13.43 | 1.319 |
| 7 | 18.814 | 18.887 | .8 | 38.0 | 59.4 | 44.5 | 319.3 | 1.088 | 13.46 | 1.323 |
| 8 | 16.721 | 17.071 | -.5 | 40.2 | 55.6 | 34.0 | 317.5 | 1.093 | 13.69 | 1.325 |
| 9 | 15.651 | 16.198 | .6 | 42.7 | 52.8 | 26.6 | 317.8 | 1.096 | 13.82 | 1.322 |
| 10 | 14.536 | 15.352 | 3.9 | 44.6 | 51.8 | 17.3 | 319.6 | 1.095 | 13.82 | 1.334 |
| 11 | 13.952 | 14.938 | -.7 | 42.1 | 57.5 | 16.2 | 319.9 | 1.096 | 13.39 | 1.369 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 139.7 | 171.2 | 342.9 | 249.5 | 139.6 | 136.3 | 4.0 | 103.6 | 317.2 | 312.6 |
| 2 | 144.4 | 173.3 | 340.0 | 244.3 | 144.4 | 138.1 | 2.5 | 104.7 | 310.3 | 306.3 |
| 3 | 148.8 | 173.7 | 334.4 | 237.3 | 148.8 | 141.0 | -4.4 | 101.4 | 295.1 | 292.3 |
| 4 | 149.4 | 173.9 | 323.3 | 229.2 | 149.3 | 142.1 | -5.1 | 100.3 | 281.7 | 280.1 |
| 5 | 148.9 | 176.0 | 312.2 | 220.1 | 148.8 | 141.9 | -1.2 | 104.1 | 273.3 | 272.4 |
| 6 | 147.8 | 178.1 | 303.1 | 212.3 | 147.8 | 142.2 | .5 | 107.3 | 265.2 | 265.0 |
| 7 | 148.7 | 183.3 | 292.4 | 202.6 | 148.7 | 144.4 | 2.1 | 112.8 | 253.9 | 254.9 |
| 8 | 155.1 | 198.3 | 274.6 | 182.7 | 155.1 | 151.6 | -1.3 | 127.9 | 225.3 | 230.0 |
| 9 | 158.8 | 208.8 | 262.8 | 171.5 | 158.8 | 153.3 | 1.6 | 141.7 | 211.1 | 218.5 |
| 10 | 146.5 | 224.0 | 236.6 | 167.0 | 146.2 | 159.5 | 9.8 | 157.3 | 195.9 | 206.8 |
| 11 | 121.0 | 227.3 | 224.9 | 175.4 | 121.0 | 168.5 | -1.5 | 152.5 | 188.1 | 201.4 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .394 | .464 | .966 | .676 | .393 | .369 | .976 | 1.258 |
| 2 | .408 | .471 | .962 | .663 | .408 | .375 | .956 | 1.237 |
| 3 | .424 | .474 | .952 | .648 | .423 | .385 | .948 | 1.236 |
| 4 | .426 | .476 | .921 | .628 | .425 | .389 | .952 | 1.216 |
| 5 | .424 | .482 | .888 | .603 | .424 | .389 | .953 | 1.173 |
| 6 | .420 | .488 | .861 | .582 | .420 | .390 | .962 | 1.144 |
| 7 | .423 | .503 | .831 | .556 | .423 | .396 | .971 | 1.101 |
| 8 | .443 | .547 | .784 | .504 | .443 | .418 | .977 | 1.020 |
| 9 | .453 | .577 | .751 | .473 | .453 | .423 | .966 | .947 |
| 10 | .416 | .620 | .671 | .462 | .415 | .441 | 1.091 | .862 |
| 11 | .341 | .629 | .635 | .486 | .341 | .466 | 1.392 | .954 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.1 | 1.6 | 2.6 | .381 | .835 | .109 | .105 | .022 | .022 |
| 2 | 10.00 | 3.8 | 1.3 | 2.0 | .392 | .832 | .113 | .110 | .024 | .023 |
| 3 | 20.00 | 4.2 | 1.5 | 2.2 | .402 | .816 | .125 | .123 | .026 | .026 |
| 4 | 30.00 | 4.8 | 1.8 | 3.0 | .401 | .871 | .089 | .088 | .019 | .018 |
| 5 | 36.00 | 4.9 | 1.6 | 3.1 | .406 | .904 | .068 | .068 | .014 | .014 |
| 6 | 42.00 | 5.3 | 1.6 | 3.4 | .412 | .935 | .047 | .047 | .010 | .010 |
| 7 | 50.00 | 5.3 | 1.1 | 3.4 | .423 | .948 | .040 | .040 | .009 | .009 |
| 8 | 70.00 | 4.3 | -.9 | 4.0 | .465 | .898 | .091 | .091 | .021 | .021 |
| 9 | 80.00 | 2.1 | -3.3 | 4.4 | .487 | .868 | .130 | .130 | .030 | .030 |
| 10 | 90.00 | .3 | -4.9 | 5.6 | .448 | .901 | .117 | .117 | .027 | .027 |
| 11 | 95.00 | 4.6 | -.3 | 11.0 | .383 | .975 | .033 | .033 | .007 | .007 |

TABLE VIII. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(g) 80 Percent of design speed; reading 172

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 2.9 | 45.5 | 67.4 | 57.9 | 328.8 | 1.108 | 13.72 | 1.327 |
| 2 | 23.002 | 22.708 | 2.6 | 46.2 | 66.9 | 56.7 | 327.8 | 1.109 | 13.71 | 1.333 |
| 3 | 21.951 | 21.742 | 3.8 | 48.3 | 65.9 | 54.3 | 325.5 | 1.109 | 13.68 | 1.331 |
| 4 | 20.899 | 20.780 | 1.7 | 47.4 | 65.8 | 52.5 | 324.0 | 1.106 | 13.60 | 1.333 |
| 5 | 20.272 | 20.206 | .7 | 46.2 | 65.8 | 50.8 | 323.6 | 1.104 | 13.55 | 1.334 |
| 6 | 19.647 | 19.637 | -1.0 | 44.6 | 65.8 | 49.2 | 323.4 | 1.101 | 13.51 | 1.334 |
| 7 | 18.814 | 18.887 | -.6 | 44.6 | 64.8 | 46.2 | 323.0 | 1.098 | 13.52 | 1.332 |
| 8 | 16.721 | 17.071 | 2.9 | 48.0 | 59.6 | 32.7 | 319.3 | 1.100 | 13.60 | 1.340 |
| 9 | 15.651 | 16.198 | 4.5 | 49.9 | 56.7 | 24.8 | 319.2 | 1.100 | 13.78 | 1.337 |
| 10 | 14.536 | 15.352 | 7.6 | 51.3 | 56.4 | 15.4 | 319.7 | 1.099 | 13.64 | 1.341 |
| 11 | 13.952 | 14.938 | .8 | 47.6 | 61.7 | 15.7 | 320.1 | 1.099 | 13.38 | 1.352 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 128.9 | 170.5 | 335.7 | 224.5 | 128.8 | 119.4 | 6.5 | 121.7 | 316.5 | 311.9 |
| 2 | 129.4 | 172.1 | 330.1 | 217.2 | 129.3 | 119.2 | 5.9 | 124.1 | 309.6 | 305.6 |
| 3 | 120.7 | 171.9 | 314.1 | 199.2 | 128.4 | 116.3 | 8.5 | 130.7 | 295.2 | 292.4 |
| 4 | 125.2 | 173.2 | 305.0 | 192.6 | 125.1 | 117.3 | 3.7 | 127.4 | 281.8 | 280.2 |
| 5 | 122.2 | 173.8 | 298.3 | 190.2 | 122.2 | 120.3 | 1.5 | 125.4 | 273.6 | 272.7 |
| 6 | 120.0 | 173.3 | 292.8 | 188.9 | 120.0 | 123.3 | -2.2 | 121.7 | 264.9 | 264.8 |
| 7 | 119.6 | 175.8 | 281.3 | 181.0 | 119.6 | 125.2 | -1.3 | 123.5 | 253.2 | 254.2 |
| 8 | 128.4 | 196.1 | 253.6 | 155.8 | 128.2 | 131.2 | 6.4 | 145.8 | 225.2 | 229.9 |
| 9 | 132.6 | 205.7 | 240.5 | 145.9 | 132.2 | 132.5 | 10.3 | 157.4 | 211.3 | 218.7 |
| 10 | 120.5 | 217.2 | 216.0 | 140.8 | 119.4 | 135.7 | 16.0 | 169.6 | 196.0 | 207.0 |
| 11 | 100.8 | 217.0 | 212.3 | 152.0 | 100.8 | 146.3 | 1.4 | 160.3 | 188.2 | 201.5 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .359 | .455 | .935 | .599 | .359 | .318 | .927 | 1.268 |
| 2 | .361 | .460 | .922 | .580 | .361 | .318 | .922 | 1.254 |
| 3 | .361 | .469 | .880 | .535 | .360 | .312 | .905 | 1.215 |
| 4 | .351 | .466 | .856 | .519 | .351 | .316 | .937 | 1.228 |
| 5 | .343 | .469 | .837 | .513 | .343 | .324 | .984 | 1.230 |
| 6 | .337 | .468 | .822 | .510 | .337 | .333 | 1.028 | 1.233 |
| 7 | .336 | .477 | .790 | .491 | .336 | .339 | 1.047 | 1.194 |
| 8 | .363 | .537 | .717 | .427 | .363 | .359 | 1.023 | 1.035 |
| 9 | .375 | .565 | .681 | .401 | .374 | .364 | 1.002 | .953 |
| 10 | .340 | .599 | .610 | .388 | .337 | .374 | 1.137 | .882 |
| 11 | .283 | .598 | .597 | .418 | .283 | .403 | 1.451 | .982 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 5.5 | 3.0 | 3.6 | .460 | .775 | .171 | .169 | .034 | .034 |
| 2 | 10.00 | 5.9 | 3.4 | 3.2 | .474 | .781 | .173 | .171 | .035 | .035 |
| 3 | 20.00 | 6.4 | 3.8 | 2.9 | .503 | .779 | .186 | .185 | .038 | .038 |
| 4 | 30.00 | 8.1 | 5.0 | 3.8 | .505 | .805 | .168 | .168 | .035 | .035 |
| 5 | 36.00 | 9.2 | 5.9 | 4.0 | .499 | .828 | .150 | .150 | .031 | .031 |
| 6 | 42.00 | 10.3 | 6.6 | 4.7 | .490 | .852 | .130 | .130 | .027 | .027 |
| 7 | 50.00 | 10.7 | 6.5 | 5.1 | .492 | .873 | .116 | .116 | .024 | .024 |
| 8 | 70.00 | 8.3 | 3.1 | 2.7 | .538 | .874 | .137 | .137 | .032 | .032 |
| 9 | 80.00 | 6.0 | .5 | 2.7 | .554 | .862 | .165 | .165 | .038 | .038 |
| 10 | 90.00 | 4.9 | -.3 | 3.7 | .525 | .881 | .171 | .171 | .040 | .040 |
| 11 | 95.00 | 8.8 | 3.9 | 10.5 | .463 | .905 | .143 | .143 | .032 | .032 |

TABLE VIII. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE ROTOR

(h) 80 Percent of design speed; reading 183

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.533 | 23.188 | 1.9 | 40.5 | 66.7 | 56.9 | 326.3 | 1.102 | 13.67 | 1.324 |
| 2 | 23.002 | 22.708 | 2.0 | 41.9 | 65.9 | 55.7 | 324.9 | 1.104 | 13.68 | 1.327 |
| 3 | 21.951 | 21.742 | .6 | 42.4 | 65.1 | 53.9 | 322.2 | 1.105 | 13.64 | 1.327 |
| 4 | 20.899 | 20.780 | .9 | 42.8 | 64.3 | 51.5 | 321.4 | 1.101 | 13.59 | 1.334 |
| 5 | 20.272 | 20.206 | 1.3 | 43.0 | 63.9 | 49.6 | 321.6 | 1.099 | 13.55 | 1.335 |
| 6 | 19.647 | 19.637 | .7 | 42.5 | 63.6 | 47.9 | 321.7 | 1.096 | 13.50 | 1.339 |
| 7 | 18.814 | 18.887 | 1.4 | 43.0 | 62.3 | 45.2 | 321.5 | 1.094 | 13.54 | 1.332 |
| 8 | 16.721 | 17.071 | 1.6 | 45.3 | 57.6 | 33.8 | 318.7 | 1.096 | 13.68 | 1.332 |
| 9 | 15.651 | 16.198 | 2.9 | 47.4 | 55.0 | 25.8 | 318.7 | 1.098 | 13.84 | 1.334 |
| 10 | 14.536 | 15.352 | 6.6 | 49.6 | 54.6 | 15.7 | 319.6 | 1.098 | 13.68 | 1.350 |
| 11 | 13.952 | 14.938 | .4 | 46.6 | 59.9 | 16.2 | 320.1 | 1.098 | 13.38 | 1.358 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 134.9 | 172.6 | 341.4 | 240.3 | 134.8 | 131.3 | 4.4 | 112.1 | 318.0 | 313.4 |
| 2 | 136.8 | 173.8 | 334.2 | 229.8 | 136.7 | 129.4 | 4.8 | 116.0 | 309.8 | 305.8 |
| 3 | 136.8 | 174.1 | 325.3 | 218.4 | 136.8 | 128.6 | 1.5 | 117.4 | 296.6 | 293.8 |
| 4 | 134.7 | 175.3 | 310.9 | 206.6 | 134.7 | 128.6 | 2.2 | 119.1 | 282.4 | 280.8 |
| 5 | 132.4 | 176.4 | 300.7 | 199.3 | 132.4 | 129.0 | 3.0 | 120.3 | 273.0 | 272.1 |
| 6 | 130.4 | 177.0 | 292.9 | 194.5 | 130.4 | 130.5 | 1.7 | 119.6 | 264.0 | 263.9 |
| 7 | 131.2 | 179.4 | 282.3 | 186.0 | 131.2 | 131.1 | 3.3 | 122.4 | 253.3 | 254.3 |
| 8 | 140.6 | 194.4 | 262.0 | 164.5 | 140.6 | 136.7 | 3.9 | 138.1 | 225.0 | 229.7 |
| 9 | 143.3 | 205.8 | 249.4 | 154.8 | 143.2 | 139.3 | 7.3 | 151.4 | 211.4 | 218.8 |
| 10 | 129.7 | 219.5 | 222.3 | 147.7 | 128.9 | 142.2 | 14.9 | 167.2 | 195.0 | 207.0 |
| 11 | 108.8 | 217.5 | 216.7 | 155.6 | 108.8 | 149.4 | .7 | 158.0 | 188.2 | 201.5 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .378 | .464 | .956 | .646 | .378 | .353 | .974 | 1.272 |
| 2 | .384 | .468 | .939 | .619 | .384 | .348 | .947 | 1.241 |
| 3 | .386 | .471 | .918 | .590 | .386 | .348 | .941 | 1.243 |
| 4 | .380 | .475 | .878 | .560 | .380 | .349 | .955 | 1.215 |
| 5 | .374 | .479 | .848 | .541 | .373 | .350 | .975 | 1.190 |
| 6 | .368 | .481 | .826 | .529 | .368 | .355 | 1.001 | 1.176 |
| 7 | .370 | .489 | .796 | .507 | .370 | .357 | 1.000 | 1.135 |
| 8 | .399 | .533 | .744 | .452 | .399 | .375 | .973 | 1.020 |
| 9 | .407 | .566 | .708 | .426 | .407 | .383 | .973 | .948 |
| 10 | .367 | .606 | .629 | .408 | .364 | .392 | 1.104 | .868 |
| 11 | .306 | .599 | .610 | .429 | .306 | .412 | 1.374 | .967 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.8 | 2.3 | 2.6 | .414 | .814 | .131 | .128 | .027 | .026 |
| 2 | 10.00 | 4.8 | 2.3 | 2.1 | .435 | .809 | .141 | .139 | .029 | .029 |
| 3 | 20.00 | 5.7 | 3.0 | 2.6 | .454 | .804 | .150 | .149 | .031 | .031 |
| 4 | 30.00 | 6.7 | 3.6 | 2.8 | .462 | .846 | .123 | .122 | .026 | .026 |
| 5 | 36.00 | 7.3 | 3.9 | 2.9 | .465 | .872 | .106 | .106 | .022 | .022 |
| 6 | 42.00 | 8.0 | 4.3 | 3.3 | .464 | .902 | .083 | .083 | .018 | .018 |
| 7 | 50.00 | 8.2 | 4.0 | 4.0 | .471 | .911 | .078 | .078 | .017 | .017 |
| 8 | 70.00 | 6.2 | 1.0 | 3.9 | .514 | .884 | .116 | .116 | .026 | .026 |
| 9 | 80.00 | 4.3 | -1.1 | 3.7 | .531 | .871 | .142 | .142 | .033 | .033 |
| 10 | 90.00 | 3.0 | -2.2 | 4.0 | .505 | .909 | .124 | .124 | .029 | .029 |
| 11 | 95.00 | 7.0 | 2.1 | 11.0 | .455 | .929 | .103 | .103 | .023 | .023 |

TABLE IX. - BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(a) 100 Percent of design speed; reading 123

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 44.9 | -1.0 | 44.9 | -1.0 | 408.0 | 1.000 | 25.08 | .970 |
| 2 | 22.647 | 22.685 | 44.4 | .9 | 44.4 | .9 | 404.9 | 1.000 | 25.15 | .970 |
| 3 | 21.727 | 21.801 | 44.3 | 1.7 | 44.3 | 1.7 | 399.0 | 1.000 | 25.05 | .972 |
| 4 | 20.823 | 20.922 | 43.8 | 1.6 | 43.8 | 1.6 | 394.5 | 1.000 | 25.00 | .975 |
| 5 | 20.287 | 20.401 | 43.3 | 1.0 | 43.3 | 1.0 | 392.6 | 1.000 | 24.91 | .975 |
| 6 | 19.756 | 19.883 | 42.4 | .3 | 42.4 | .3 | 391.1 | 1.000 | 24.75 | .976 |
| 7 | 19.060 | 19.205 | 43.4 | .2 | 43.4 | .2 | 389.3 | 1.000 | 24.47 | .981 |
| 8 | 17.369 | 17.567 | 46.9 | -.6 | 46.9 | -.6 | 385.0 | 1.000 | 24.28 | .979 |
| 9 | 16.548 | 16.787 | 50.4 | 2.0 | 50.4 | 2.0 | 385.3 | 1.000 | 24.31 | .972 |
| 10 | 15.740 | 16.040 | 54.2 | 1.7 | 54.2 | 1.7 | 386.8 | 1.000 | 24.02 | .953 |
| 11 | 15.339 | 15.682 | 51.5 | .2 | 51.5 | .2 | 388.1 | 1.000 | 23.65 | .959 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 230.4 | 168.0 | 230.4 | 168.0 | 163.1 | 168.0 | 162.7 | -2.8 | .0 | .0 |
| 2 | 232.6 | 169.3 | 232.6 | 169.3 | 166.2 | 169.2 | 162.7 | 2.7 | .0 | .0 |
| 3 | 235.5 | 168.7 | 235.5 | 168.7 | 168.5 | 168.7 | 164.5 | 5.0 | .0 | .0 |
| 4 | 236.6 | 167.4 | 236.6 | 167.4 | 170.7 | 167.3 | 163.8 | 4.6 | .0 | .0 |
| 5 | 237.9 | 165.4 | 237.9 | 165.4 | 173.1 | 165.4 | 163.2 | 2.8 | .0 | .0 |
| 6 | 236.7 | 162.1 | 236.7 | 162.1 | 174.7 | 162.1 | 159.8 | .7 | .0 | .0 |
| 7 | 236.4 | 158.1 | 236.4 | 158.1 | 171.7 | 158.1 | 162.4 | .5 | .0 | .0 |
| 8 | 241.0 | 155.5 | 241.0 | 155.5 | 164.7 | 155.5 | 176.0 | -1.5 | .0 | .0 |
| 9 | 246.2 | 149.6 | 246.2 | 149.6 | 156.8 | 149.5 | 189.8 | 5.3 | .0 | .0 |
| 10 | 255.6 | 132.7 | 255.6 | 132.7 | 149.5 | 132.6 | 207.4 | 3.9 | .0 | .0 |
| 11 | 253.3 | 125.4 | 253.3 | 125.4 | 157.8 | 125.4 | 198.1 | .5 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .589 | .423 | .589 | .423 | .417 | .423 | 1.030 | .945 |
| 2 | .597 | .428 | .597 | .428 | .427 | .428 | 1.018 | .938 |
| 3 | .610 | .430 | .610 | .430 | .437 | .429 | 1.001 | .942 |
| 4 | .617 | .428 | .617 | .428 | .445 | .428 | .980 | .932 |
| 5 | .622 | .424 | .622 | .424 | .453 | .424 | .955 | .922 |
| 6 | .620 | .416 | .620 | .416 | .458 | .416 | .928 | .892 |
| 7 | .621 | .407 | .621 | .407 | .451 | .407 | .920 | .900 |
| 8 | .638 | .402 | .638 | .402 | .436 | .402 | .944 | .959 |
| 9 | .652 | .386 | .652 | .386 | .415 | .386 | .953 | 1.031 |
| 10 | .678 | .341 | .678 | .341 | .396 | .341 | .887 | 1.122 |
| 11 | .670 | .321 | .670 | .321 | .417 | .321 | .795 | 1.028 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 9.7 | 4.0 | 13.9 | .551 | .000 | .144 | .144 | .056 | .056 |
| 2 | 10.00 | 9.4 | 3.7 | 14.2 | .535 | .000 | .139 | .139 | .053 | .053 |
| 3 | 20.00 | 9.6 | 3.9 | 12.9 | .532 | .000 | .125 | .125 | .046 | .046 |
| 4 | 30.00 | 9.1 | 3.5 | 11.9 | .529 | .000 | .112 | .112 | .039 | .039 |
| 5 | 36.00 | 8.4 | 2.8 | 11.1 | .536 | .000 | .108 | .108 | .037 | .037 |
| 6 | 42.00 | 7.0 | 1.5 | 10.3 | .539 | .000 | .105 | .105 | .035 | .035 |
| 7 | 50.00 | 7.2 | 1.7 | 10.1 | .552 | .000 | .083 | .083 | .027 | .027 |
| 8 | 70.00 | 7.9 | 2.6 | 9.8 | .571 | .000 | .088 | .088 | .026 | .026 |
| 9 | 80.00 | 9.0 | 3.8 | 13.3 | .602 | .000 | .112 | .112 | .031 | .031 |
| 10 | 90.00 | 9.1 | 4.0 | 15.3 | .692 | .000 | .176 | .176 | .047 | .047 |
| 11 | 95.00 | 4.0 | -1.0 | 15.7 | .706 | .000 | .158 | .158 | .041 | .041 |

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(b) 100 Percent of design speed; reading 1140

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 39.9 | .6 | 39.9 | .6 | 390.7 | 1.000 | 22.47 | .974 |
| 2 | 22.647 | 22.685 | 39.3 | 1.2 | 39.3 | 1.2 | 388.5 | 1.000 | 22.56 | .978 |
| 3 | 21.727 | 21.801 | 37.6 | .4 | 37.6 | .4 | 383.6 | 1.000 | 22.62 | .986 |
| 4 | 20.823 | 20.922 | 37.6 | -.1 | 37.6 | -.1 | 380.7 | 1.000 | 22.53 | .988 |
| 5 | 20.287 | 20.401 | 37.9 | -.7 | 37.9 | -.7 | 379.6 | 1.000 | 22.47 | .988 |
| 6 | 19.756 | 19.883 | 37.4 | -1.2 | 37.4 | -1.2 | 378.9 | 1.000 | 22.47 | .988 |
| 7 | 19.060 | 19.205 | 36.9 | -1.0 | 36.9 | -1.0 | 378.4 | 1.000 | 22.69 | .986 |
| 8 | 17.369 | 17.567 | 37.5 | -1.9 | 37.5 | -1.9 | 376.9 | 1.000 | 23.30 | .985 |
| 9 | 16.548 | 16.787 | 39.4 | -1.5 | 39.4 | -1.5 | 378.1 | 1.000 | 23.32 | .987 |
| 10 | 15.740 | 16.040 | 41.5 | .6 | 41.5 | .6 | 380.1 | 1.000 | 23.30 | .949 |
| 11 | 15.339 | 15.682 | 41.5 | .2 | 41.5 | .2 | 380.9 | 1.000 | 23.04 | .939 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 223.1 | 169.2 | 223.1 | 169.2 | 171.3 | 169.2 | 143.0 | 1.6 | .0 | .0 |
| 2 | 225.8 | 173.5 | 225.8 | 173.5 | 174.7 | 173.5 | 143.0 | 3.5 | .0 | .0 |
| 3 | 228.4 | 178.6 | 228.4 | 178.6 | 181.0 | 178.6 | 139.3 | 1.2 | .0 | .0 |
| 4 | 229.7 | 178.3 | 229.7 | 178.3 | 182.1 | 178.3 | 140.0 | -.4 | .0 | .0 |
| 5 | 230.7 | 176.8 | 230.7 | 176.8 | 182.0 | 176.8 | 141.8 | -2.2 | .0 | .0 |
| 6 | 232.6 | 177.3 | 232.6 | 177.3 | 184.7 | 177.3 | 141.3 | -3.8 | .0 | .0 |
| 7 | 239.9 | 181.8 | 239.9 | 181.8 | 191.8 | 181.8 | 144.0 | -3.2 | .0 | .0 |
| 8 | 256.4 | 199.4 | 256.4 | 199.4 | 203.3 | 199.2 | 156.2 | -6.7 | .0 | .0 |
| 9 | 262.5 | 200.4 | 262.5 | 200.4 | 202.9 | 200.4 | 166.6 | -5.4 | .0 | .0 |
| 10 | 268.1 | 185.8 | 268.1 | 185.8 | 200.7 | 185.8 | 177.8 | 1.8 | .0 | .0 |
| 11 | 266.5 | 174.6 | 266.5 | 174.6 | 199.6 | 174.6 | 176.6 | .6 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .582 | .435 | .582 | .435 | .447 | .435 | .988 | .822 |
| 2 | .592 | .448 | .592 | .448 | .458 | .448 | .993 | .815 |
| 3 | .603 | .465 | .603 | .465 | .478 | .465 | .987 | .777 |
| 4 | .609 | .466 | .609 | .466 | .483 | .466 | .979 | .773 |
| 5 | .613 | .463 | .613 | .463 | .483 | .463 | .972 | .779 |
| 6 | .619 | .465 | .619 | .465 | .492 | .465 | .960 | .764 |
| 7 | .640 | .477 | .640 | .477 | .512 | .477 | .948 | .763 |
| 8 | .690 | .527 | .690 | .527 | .547 | .526 | .980 | .784 |
| 9 | .707 | .529 | .707 | .529 | .546 | .529 | .988 | .821 |
| 10 | .721 | .487 | .721 | .487 | .540 | .487 | .926 | .857 |
| 11 | .716 | .456 | .716 | .456 | .536 | .456 | .875 | .823 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.0 | -1.7 | 14.8 | .489 | .000 | .128 | .128 | .050 | .050 |
| 2 | 10.00 | 3.7 | -2.0 | 13.8 | .468 | .000 | .107 | .107 | .041 | .041 |
| 3 | 20.00 | 2.2 | -3.5 | 11.0 | .440 | .000 | .065 | .065 | .024 | .024 |
| 4 | 30.00 | 2.2 | -3.4 | 9.6 | .439 | .000 | .052 | .052 | .018 | 018 |
| 5 | 36.00 | 2.4 | -3.2 | 8.8 | .447 | .000 | .054 | .054 | .019 | .019 |
| 6 | 42.00 | 1.4 | -4.2 | 8.2 | .446 | .000 | .052 | .052 | .017 | .017 |
| 7 | 50.00 | .1 | -5.4 | 8.3 | .440 | .000 | .058 | .058 | .019 | .019 |
| 8 | 70.00 | -2.1 | -7.4 | 7.8 | 409 | .000 | .054 | .054 | .016 | .016 |
| 9 | 80.00 | -2.7 | -7.9 | 9.1 | .419 | .000 | .047 | .047 | .013 | .013 |
| 10 | 90.00 | -4.1 | -9.3 | 13.6 | .481 | .000 | .174 | .174 | .047 | 047 |
| 11 | 95.00 | -6.5 | -11.5 | 15.1 | .516 | .000 | .211 | .211 | .055 | .055 |

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(c) 100 Percent of design speed; reading 1157

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 41.9 | 2.2 | 41.9 | 2.2 | 396.6 | 1.000 | 23.45 | .979 |
| 2 | 22.647 | 22.685 | 41.7 | 2.9 | 41.7 | 2.9 | 394.4 | 1.000 | 23.47 | .979 |
| 3 | 21.727 | 21.801 | 40.3 | 1.9 | 40.3 | 1.9 | 389.7 | 1.000 | 23.56 | .979 |
| 4 | 20.823 | 20.922 | 40.1 | 1.3 | 40.1 | 1.3 | 385.5 | 1.000 | 23.40 | .985 |
| 5 | 20.287 | 20.401 | 40.3 | .6 | 40.3 | .6 | 384.1 | 1.000 | 23.29 | .987 |
| 6 | 19.756 | 19.883 | 39.4 | -.2 | 39.4 | -.2 | 383.3 | 1.000 | 23.29 | .987 |
| 7 | 19.060 | 19.205 | 38.6 | -.4 | 38.6 | -.4 | 381.7 | 1.000 | 23.40 | .986 |
| 8 | 17.369 | 17.567 | 39.6 | -1.9 | 39.6 | -1.9 | 378.6 | 1.000 | 23.79 | .986 |
| 9 | 16.548 | 16.787 | 42.1 | -.7 | 42.1 | -.7 | 379.6 | 1.000 | 23.68 | .988 |
| 10 | 15.740 | 16.040 | 45.0 | .8 | 45.0 | .8 | 381.5 | 1.000 | 23.65 | .952 |
| 11 | 15.339 | 15.682 | 45.0 | .2 | 45.0 | .2 | 382.3 | 1.000 | 23.21 | .949 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 227.9 | 172.6 | 227.9 | 172.6 | 169.5 | 172.4 | 152.3 | 6.6 | .0 | .0 |
| 2 | 229.3 | 173.2 | 229.3 | 173.2 | 171.3 | 173.0 | 152.5 | 8.8 | .0 | .0 |
| 3 | 232.3 | 174.1 | 232.3 | 174.1 | 177.2 | 174.0 | 150.2 | 5.7 | .0 | .0 |
| 4 | 232.5 | 173.3 | 232.5 | 173.3 | 177.9 | 173.2 | 149.6 | 4.0 | .0 | .0 |
| 5 | 233.1 | 172.2 | 233.1 | 172.2 | 177.8 | 172.2 | 150.7 | 1.8 | .0 | .0 |
| 6 | 234.8 | 172.2 | 234.8 | 172.2 | 181.5 | 172.2 | 149.0 | -.5 | .0 | .0 |
| 7 | 240.4 | 174.9 | 240.4 | 174.9 | 188.0 | 174.9 | 149.8 | -1.1 | .0 | .0 |
| 8 | 251.0 | 185.9 | 251.0 | 185.9 | 193.3 | 185.8 | 160.1 | -6.0 | .0 | .0 |
| 9 | 255.7 | 183.8 | 255.7 | 183.8 | 189.7 | 183.8 | 171.5 | -2.3 | .0 | .0 |
| 10 | 261.1 | 166.4 | 261.1 | 166.4 | 184.7 | 166.4 | 184.5 | 2.4 | .0 | .0 |
| 11 | 256.9 | 152.5 | 256.9 | 152.5 | 181.6 | 152.5 | 181.7 | .7 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .591 | .441 | .591 | .441 | .440 | .441 | 1.017 | .873 |
| 2 | .597 | .444 | .597 | .444 | .446 | .443 | 1.010 | .867 |
| 3 | .609 | .449 | .609 | .449 | .464 | .449 | .982 | .841 |
| 4 | .613 | .450 | .613 | .450 | .469 | .449 | .974 | .831 |
| 5 | .616 | .447 | .616 | .447 | .470 | .447 | .968 | .832 |
| 6 | .621 | .448 | .621 | .448 | .480 | .448 | .949 | .810 |
| 7 | .639 | .456 | .639 | .456 | .500 | .456 | .930 | .799 |
| 8 | .672 | .488 | .672 | .488 | .518 | .488 | .961 | .820 |
| 9 | .685 | .482 | .685 | .482 | .508 | .482 | .969 | .867 |
| 10 | .699 | .433 | .699 | .433 | .495 | .433 | .901 | .919 |
| 11 | .686 | .396 | .686 | .396 | .485 | .396 | .840 | .882 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 6.0 | .2 | 16.3 | .492 | .000 | .102 | .102 | .040 | .040 |
| 2 | 10.00 | 6.0 | .2 | 15.4 | .485 | .000 | .098 | .098 | .037 | .037 |
| 3 | 20.00 | 4.8 | -.9 | 12.3 | .479 | .000 | .093 | .093 | .034 | .034 |
| 4 | 30.00 | 4.6 | -1.0 | 10.9 | .475 | .000 | .068 | .068 | .024 | .024 |
| 5 | 36.00 | 4.6 | -1.0 | 9.9 | .480 | .000 | .057 | .057 | .020 | .020 |
| 6 | 42.00 | 3.2 | -2.3 | 9.1 | .479 | .000 | .058 | .058 | .019 | .019 |
| 7 | 50.00 | 1.6 | -3.9 | 8.8 | .475 | .000 | .057 | .057 | .018 | .018 |
| 8 | 70.00 | -.1 | -5.4 | 7.8 | .454 | .000 | .052 | .052 | .015 | .015 |
| 9 | 80.00 | -.0 | -5.3 | 9.8 | .471 | .000 | .046 | .046 | .013 | .013 |
| 10 | 90.00 | -.8 | -6.0 | 13.7 | .548 | .000 | .173 | .173 | .046 | .046 |
| 11 | 95.00 | -3.1 | -8.2 | 15.0 | .589 | .000 | .190 | .190 | .050 | .050 |

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(d) 100 Percent of design speed: reading 1168

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 34.3 | -1.6 | 34.3 | -1.6 | 381.2 | 1.000 | 20.22 | .979 |
| 2 | 22.647 | 22.685 | 32.8 | -.3 | 32.8 | -.3 | 379.2 | 1.000 | 20.50 | .983 |
| 3 | 21.727 | 21.801 | 30.2 | -1.1 | 30.2 | -1.1 | 374.4 | 1.000 | 20.86 | .984 |
| 4 | 20.823 | 20.922 | 30.3 | -1.2 | 30.3 | -1.2 | 372.2 | 1.000 | 20.82 | .988 |
| 5 | 20.287 | 20.401 | 31.1 | -1.4 | 31.1 | -1.4 | 371.7 | 1.000 | 20.77 | .987 |
| 6 | 19.756 | 19.883 | 31.1 | -1.8 | 31.1 | -1.9 | 371.1 | 1.000 | 20.65 | .987 |
| 7 | 19.060 | 19.205 | 31.7 | -2.3 | 31.7 | -2.3 | 370.9 | 1.000 | 20.66 | .988 |
| 8 | 17.369 | 17.567 | 33.8 | -2.5 | 33.8 | -2.5 | 372.9 | 1.000 | 21.51 | .983 |
| 9 | 16.548 | 16.787 | 35.3 | -1.3 | 35.3 | -1.3 | 375.8 | 1.000 | 22.25 | .984 |
| 10 | 15.740 | 16.040 | 37.9 | 1.1 | 37.9 | 1.1 | 379.8 | 1.000 | 22.75 | .951 |
| 11 | 15.339 | 15.682 | 38.2 | 1.0 | 38.2 | 1.0 | 380.3 | 1.000 | 22.35 | .924 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 214.9 | 174.4 | 214.9 | 174.4 | 177.6 | 174.3 | 121.0 | -4.8 | .0 | .0 |
| 2 | 222.1 | 184.0 | 222.1 | 184.0 | 186.6 | 184.0 | 120.5 | -.8 | .0 | .0 |
| 3 | 230.0 | 193.6 | 230.0 | 193.6 | 198.7 | 193.5 | 115.7 | -3.6 | .0 | .0 |
| 4 | 232.2 | 194.9 | 232.2 | 194.9 | 200.5 | 194.8 | 117.0 | -4.0 | .0 | .0 |
| 5 | 232.4 | 193.3 | 232.4 | 193.3 | 199.0 | 193.3 | 119.9 | -4.6 | .0 | .0 |
| 6 | 231.3 | 191.6 | 231.3 | 191.6 | 198.2 | 191.5 | 119.4 | -6.0 | .0 | .0 |
| 7 | 233.9 | 192.5 | 233.9 | 192.5 | 199.0 | 192.3 | 122.9 | -7.6 | .0 | .0 |
| 8 | 257.0 | 217.3 | 257.0 | 217.3 | 213.7 | 217.1 | 142.8 | -9.5 | .0 | .0 |
| 9 | 274.6 | 236.1 | 274.6 | 236.1 | 224.1 | 236.0 | 158.7 | -5.5 | .0 | .0 |
| 10 | 287.0 | 233.9 | 287.0 | 233.9 | 226.6 | 233.9 | 176.2 | 4.4 | .0 | .0 |
| 11 | 282.9 | 213.6 | 282.9 | 213.6 | 222.3 | 213.6 | 175.0 | 3.6 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .567 | .455 | .567 | .455 | .468 | .455 | .982 | .681 |
| 2 | .589 | .483 | .589 | .483 | .495 | .483 | .986 | .659 |
| 3 | .615 | .512 | .615 | .512 | .532 | .512 | .974 | .615 |
| 4 | .624 | .518 | .624 | .518 | .539 | .518 | .972 | .624 |
| 5 | .625 | .514 | .625 | .514 | .535 | .514 | .971 | .625 |
| 6 | .622 | .509 | .622 | .509 | .533 | .509 | .967 | .622 |
| 7 | .630 | .512 | .630 | .512 | .536 | .511 | .966 | .630 |
| 8 | .696 | .581 | .696 | .581 | .578 | .580 | 1.016 | .696 |
| 9 | .745 | .632 | .745 | .632 | .608 | .632 | 1.053 | .745 |
| 10 | .778 | .622 | .778 | .622 | .614 | .622 | 1.032 | .778 |
| 11 | .765 | .564 | .765 | .564 | .601 | .564 | .961 | .765 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | -1.7 | -7.5 | 12.5 | .417 | .000 | .107 | .107 | .042 | .042 |
| 2 | 10.00 | -2.9 | -8.6 | 12.2 | .381 | .000 | .083 | .083 | .032 | .032 |
| 3 | 20.00 | -5.3 | -11.0 | 9.4 | .349 | .000 | .070 | .070 | .026 | .026 |
| 4 | 30.00 | -5.2 | -10.8 | 8.4 | .344 | .000 | .052 | .052 | .018 | .018 |
| 5 | 36.00 | -4.6 | -10.2 | 8.0 | .352 | .000 | .058 | .058 | .020 | .020 |
| 6 | 42.00 | -5.1 | -10.7 | 7.5 | .353 | .000 | .055 | .055 | .018 | .018 |
| 7 | 50.00 | -5.3 | -10.7 | 6.9 | .357 | .000 | .052 | .052 | .017 | .017 |
| 8 | 70.00 | -6.0 | -11.3 | 7.1 | .328 | .000 | .061 | .061 | .018 | .018 |
| 9 | 80.00 | -6.8 | -12.1 | 9.2 | .307 | .000 | .051 | .051 | .014 | .014 |
| 10 | 90.00 | -7.9 | -13.1 | 14.0 | .344 | .000 | .147 | .147 | .039 | .039 |
| 11 | 95.00 | -10.0 | -15.0 | 15.7 | .402 | .000 | .236 | .236 | .062 | .062 |

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(e) 80 Percent of design speed; reading 136

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 25.4 | -3.7 | 25.4 | -3.7 | 339.2 | 1.000 | 15.14 | .988 |
| 2 | 22.647 | 22.685 | 23.9 | -3.2 | 23.9 | -3.2 | 338.5 | 1.000 | 15.57 | .989 |
| 3 | 21.727 | 21.801 | 20.8 | -3.8 | 20.8 | -3.8 | 336.0 | 1.000 | 15.86 | .985 |
| 4 | 20.823 | 20.922 | 21.0 | -4.0 | 21.0 | -4.0 | 335.2 | 1.000 | 15.99 | .982 |
| 5 | 20.287 | 20.401 | 22.1 | -3.6 | 22.1 | -3.6 | 335.6 | 1.000 | 16.03 | .985 |
| 6 | 19.756 | 19.883 | 23.1 | -3.1 | 23.1 | -3.1 | 336.5 | 1.000 | 16.11 | .986 |
| 7 | 19.060 | 19.205 | 24.2 | -2.8 | 24.2 | -2.8 | 337.6 | 1.000 | 16.32 | .982 |
| 8 | 17.369 | 17.567 | 26.5 | -3.8 | 26.5 | -3.8 | 340.1 | 1.000 | 16.94 | .983 |
| 9 | 16.548 | 16.787 | 28.8 | -2.5 | 28.8 | -2.5 | 343.0 | 1.000 | 17.47 | .978 |
| 10 | 15.740 | 16.040 | 32.6 | .8 | 32.6 | .8 | 347.5 | 1.000 | 17.85 | .959 |
| 11 | 15.339 | 15.682 | 32.6 | .7 | 32.6 | .7 | 348.7 | 1.000 | 17.91 | .921 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 157.5 | 148.6 | 157.5 | 148.6 | 142.3 | 148.3 | 67.5 | -9.6 | .0 | .0 |
| 2 | 173.7 | 164.8 | 173.7 | 164.8 | 158.8 | 164.5 | 70.4 | -9.3 | .0 | .0 |
| 3 | 186.2 | 176.2 | 186.2 | 176.2 | 174.1 | 175.8 | 66.0 | -11.7 | .0 | .0 |
| 4 | 190.6 | 179.3 | 190.6 | 179.3 | 178.0 | 178.9 | 68.3 | -12.5 | .0 | .0 |
| 5 | 192.8 | 182.5 | 192.8 | 182.5 | 178.7 | 182.1 | 72.4 | -11.3 | .0 | .0 |
| 6 | 196.2 | 186.0 | 196.2 | 186.0 | 180.5 | 185.7 | 76.9 | -10.2 | .0 | .0 |
| 7 | 203.2 | 191.6 | 203.2 | 191.6 | 185.4 | 191.4 | 83.3 | -9.4 | .0 | .0 |
| 8 | 227.7 | 213.8 | 227.7 | 213.8 | 203.7 | 213.3 | 101.7 | -14.3 | .0 | .0 |
| 9 | 241.8 | 229.7 | 241.8 | 229.7 | 211.8 | 229.5 | 116.6 | -10.1 | .0 | .0 |
| 10 | 255.8 | 233.7 | 255.8 | 233.7 | 215.5 | 233.6 | 137.8 | 3.4 | .0 | .0 |
| 11 | 258.0 | 220.5 | 258.0 | 220.5 | 217.2 | 220.5 | 139.1 | 2.9 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .435 | .409 | .435 | .409 | .393 | .408 | 1.042 | .435 |
| 2 | .482 | .456 | .482 | .456 | .441 | .455 | 1.036 | .482 |
| 3 | .520 | .491 | .520 | .491 | .486 | .490 | 1.010 | .520 |
| 4 | .534 | .501 | .534 | .501 | .499 | .500 | 1.005 | .534 |
| 5 | .540 | .510 | .540 | .510 | .501 | .509 | 1.019 | .540 |
| 6 | .549 | .519 | .549 | .519 | .505 | .519 | 1.029 | .549 |
| 7 | .569 | .535 | .569 | .535 | .519 | .534 | 1.032 | .569 |
| 8 | .641 | .599 | .641 | .599 | .573 | .597 | 1.047 | .641 |
| 9 | .681 | .644 | .681 | .644 | .596 | .643 | 1.084 | .681 |
| 10 | .719 | .651 | .719 | .651 | .606 | .651 | 1.084 | .719 |
| 11 | .724 | .611 | .724 | .611 | .610 | .611 | 1.015 | .724 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | -10.1 | -15.8 | 10.9 | .248 | .000 | .100 | .100 | .039 | .039 |
| 2 | 10.00 | -11.3 | -17.0 | 9.8 | .227 | .000 | .078 | .078 | .030 | .030 |
| 3 | 20.00 | -14.2 | -19.9 | 7.1 | .207 | .000 | .088 | .088 | .032 | .032 |
| 4 | 30.00 | -13.9 | -19.6 | 6.1 | .208 | .000 | .101 | .101 | .035 | .035 |
| 5 | 36.00 | -13.1 | -18.7 | 6.3 | .203 | .000 | .083 | .083 | .028 | .028 |
| 6 | 42.00 | -12.6 | -18.1 | 6.6 | .200 | .000 | .075 | .075 | .025 | .025 |
| 7 | 50.00 | -12.3 | -17.8 | 6.9 | .204 | .000 | .090 | .090 | .029 | .029 |
| 8 | 70.00 | -12.7 | -18.0 | 6.3 | .211 | .000 | .071 | .071 | .021 | .021 |
| 9 | 80.00 | -12.8 | -18.0 | 8.5 | .196 | .000 | .084 | .084 | .024 | .024 |
| 10 | 90.00 | -12.7 | -17.8 | 14.2 | .226 | .000 | .139 | .139 | .037 | .037 |
| 11 | 95.00 | -15.0 | -20.0 | 16.0 | .282 | .000 | .269 | .269 | .070 | .070 |

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(f) 80 Percent of design speed; reading 159

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 36.6 | -1.4 | 36.6 | -1.4 | 354.1 | 1.000 | 17.53 | .984 |
| 2 | 22.647 | 22.685 | 36.0 | .6 | 36.0 | .6 | 352.6 | 1.000 | 17.64 | .988 |
| 3 | 21.727 | 21.801 | 34.1 | -.6 | 34.1 | -.6 | 349.1 | 1.000 | 17.64 | .991 |
| 4 | 20.823 | 20.922 | 33.2 | -1.9 | 33.2 | -1.9 | 347.1 | 1.000 | 17.67 | .991 |
| 5 | 20.287 | 20.401 | 34.1 | -1.9 | 34.1 | -1.9 | 346.9 | 1.000 | 17.69 | .992 |
| 6 | 19.756 | 19.883 | 34.7 | -1.6 | 34.7 | -1.6 | 347.1 | 1.000 | 17.72 | .990 |
| 7 | 19.060 | 19.205 | 35.6 | -1.3 | 35.6 | -1.3 | 347.3 | 1.000 | 17.80 | .988 |
| 8 | 17.369 | 17.567 | 37.8 | -2.6 | 37.8 | -2.6 | 347.0 | 1.000 | 18.13 | .989 |
| 9 | 16.548 | 16.787 | 40.6 | -1.7 | 40.6 | -1.7 | 348.2 | 1.000 | 18.27 | .990 |
| 10 | 15.740 | 16.040 | 43.2 | .2 | 43.2 | .2 | 350.0 | 1.000 | 18.44 | .964 |
| 11 | 15.339 | 15.682 | 41.5 | -.5 | 41.5 | -.5 | 350.7 | 1.000 | 18.34 | .949 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 174.5 | 137.7 | 174.5 | 137.7 | 140.1 | 137.6 | 103.9 | -3.3 | .0 | .0 |
| 2 | 178.6 | 144.4 | 178.6 | 144.4 | 144.5 | 144.4 | 105.0 | 1.6 | .0 | .0 |
| 3 | 181.2 | 148.4 | 181.2 | 148.4 | 150.2 | 148.4 | 101.5 | -1.6 | .0 | .0 |
| 4 | 182.7 | 149.4 | 182.7 | 149.4 | 152.9 | 149.3 | 100.1 | -4.8 | .0 | .0 |
| 5 | 185.0 | 150.4 | 185.0 | 150.4 | 153.2 | 150.3 | 103.7 | -4.9 | .0 | .0 |
| 6 | 187.2 | 150.9 | 187.2 | 150.9 | 153.9 | 150.9 | 106.7 | -4.2 | .0 | .0 |
| 7 | 192.2 | 153.3 | 192.2 | 153.3 | 156.3 | 153.3 | 111.8 | -3.4 | .0 | .0 |
| 8 | 205.1 | 167.9 | 205.1 | 167.9 | 162.1 | 167.7 | 125.7 | -7.6 | .0 | .0 |
| 9 | 213.1 | 173.7 | 213.1 | 173.7 | 161.8 | 173.6 | 138.7 | -5.3 | .0 | .0 |
| 10 | 224.0 | 166.8 | 224.0 | 166.8 | 163.2 | 166.8 | 153.4 | .6 | .0 | .0 |
| 11 | 223.9 | 155.1 | 223.9 | 155.1 | 167.6 | 155.1 | 148.5 | -1.3 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .473 | .370 | .473 | .370 | .380 | .370 | .982 | .619 |
| 2 | .486 | .389 | .486 | .389 | .393 | .389 | .999 | .618 |
| 3 | .496 | .403 | .496 | .403 | .411 | .403 | .988 | .578 |
| 4 | .502 | .407 | .502 | .407 | .420 | .407 | .976 | .553 |
| 5 | .508 | .410 | .508 | .410 | .421 | .409 | .981 | .574 |
| 6 | .515 | .411 | .515 | .411 | .423 | .411 | .981 | .587 |
| 7 | .529 | .418 | .529 | .418 | .430 | .418 | .980 | .608 |
| 8 | .567 | .459 | .567 | .459 | .448 | .459 | 1.034 | .661 |
| 9 | .589 | .475 | .589 | .475 | .447 | .475 | 1.073 | .724 |
| 10 | .620 | .454 | .620 | .454 | .452 | .454 | 1.022 | .786 |
| 11 | .619 | .421 | .619 | .421 | .463 | .421 | .926 | .723 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 1.1 | -4.6 | 13.3 | .451 | .000 | .116 | .116 | .045 | .045 |
| 2 | 10.00 | .8 | -4.9 | 13.7 | .413 | .000 | .083 | .083 | .032 | .032 |
| 3 | 20.00 | -.9 | -6.6 | 10.3 | .390 | .000 | .055 | .055 | .020 | .020 |
| 4 | 30.00 | -1.7 | -7.4 | 8.3 | .384 | .000 | .056 | .056 | .020 | .020 |
| 5 | 36.00 | -1.1 | -6.6 | 8.0 | .388 | .000 | .051 | .051 | .017 | .017 |
| 6 | 42.00 | -.9 | -6.5 | 8.2 | .391 | .000 | .062 | .062 | .021 | .021 |
| 7 | 50.00 | -.9 | -6.4 | 8.4 | .395 | .000 | .068 | .068 | .022 | .022 |
| 8 | 70.00 | -1.4 | -6.7 | 7.5 | .373 | .000 | .057 | .057 | .017 | .017 |
| 9 | 80.00 | -1.0 | -6.3 | 9.3 | .374 | .000 | .049 | .049 | .014 | .014 |
| 10 | 90.00 | -2.1 | -7.2 | 13.6 | .436 | .000 | .158 | .158 | .042 | .042 |
| 11 | 95.00 | -6.1 | -11.1 | 14.8 | .480 | .000 | .225 | .225 | .059 | .059 |

TABLE IX. - Continued. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

(g) 80 Percent of design speed; reading 172

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 44.9 | .5 | 44.9 | .5 | 364.5 | 1.000 | 18.21 | .981 |
| 2 | 22.647 | 22.685 | 45.0 | 1.9 | 45.0 | 1.9 | 363.7 | 1.000 | 18.27 | .980 |
| 3 | 21.727 | 21.801 | 46.7 | 1.9 | 46.7 | 1.9 | 361.0 | 1.000 | 18.20 | .983 |
| 4 | 20.823 | 20.922 | 45.4 | .6 | 45.4 | .6 | 358.4 | 1.000 | 18.13 | .984 |
| 5 | 20.287 | 20.401 | 44.0 | .1 | 44.0 | .1 | 357.1 | 1.000 | 18.08 | .986 |
| 6 | 19.756 | 19.883 | 42.3 | -.6 | 42.3 | -.6 | 355.9 | 1.000 | 18.03 | .989 |
| 7 | 19.060 | 19.205 | 42.2 | -.9 | 42.2 | -.9 | 354.5 | 1.000 | 18.01 | .991 |
| 8 | 17.369 | 17.567 | 45.7 | -1.0 | 45.7 | -1.0 | 351.2 | 1.000 | 18.23 | .988 |
| 9 | 16.548 | 16.787 | 47.9 | .6 | 47.9 | .6 | 351.1 | 1.000 | 18.42 | .982 |
| 10 | 15.740 | 16.040 | 50.0 | .2 | 50.0 | .2 | 351.4 | 1.000 | 18.29 | .964 |
| 11 | 15.339 | 15.682 | 47.0 | -1.4 | 47.0 | -1.4 | 351.9 | 1.000 | 18.08 | .962 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 173.1 | 127.4 | 173.1 | 127.4 | 122.7 | 127.4 | 122.1 | 1.0 | .0 | .0 |
| 2 | 176.0 | 129.5 | 176.0 | 129.5 | 124.4 | 129.5 | 124.4 | 4.3 | .0 | .0 |
| 3 | 179.7 | 129.0 | 179.7 | 129.0 | 123.3 | 129.0 | 130.7 | 4.3 | .0 | .0 |
| 4 | 178.7 | 127.0 | 178.7 | 127.0 | 125.6 | 127.0 | 127.1 | 1.4 | .0 | .0 |
| 5 | 179.8 | 126.5 | 179.8 | 126.5 | 129.3 | 126.5 | 124.9 | .3 | .0 | .0 |
| 6 | 179.7 | 126.4 | 179.7 | 126.4 | 132.9 | 126.4 | 121.0 | -1.2 | .0 | .0 |
| 7 | 182.1 | 127.3 | 182.1 | 127.3 | 134.9 | 127.3 | 122.4 | -2.0 | .0 | .0 |
| 8 | 200.1 | 138.8 | 200.1 | 138.8 | 139.6 | 138.8 | 143.3 | -2.4 | .0 | .0 |
| 9 | 207.7 | 139.8 | 207.7 | 139.8 | 139.2 | 139.8 | 154.1 | 1.4 | .0 | .0 |
| 10 | 215.8 | 126.0 | 215.8 | 126.0 | 138.6 | 126.0 | 165.4 | .3 | .0 | .0 |
| 11 | 213.4 | 115.5 | 213.4 | 115.5 | 145.4 | 115.5 | 156.1 | -2.8 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .462 | .337 | .462 | .337 | .327 | .337 | 1.039 | .736 |
| 2 | .471 | .343 | .471 | .343 | .333 | .343 | 1.041 | .745 |
| 3 | .483 | .343 | .483 | .343 | .331 | .343 | 1.046 | .780 |
| 4 | .482 | .339 | .482 | .339 | .339 | .339 | 1.011 | .749 |
| 5 | .486 | .338 | .486 | .338 | .349 | .338 | .979 | .727 |
| 6 | .487 | .338 | .487 | .338 | .360 | .338 | .951 | .693 |
| 7 | .494 | .342 | .494 | .342 | .366 | .341 | .944 | .692 |
| 8 | .549 | .375 | .549 | .375 | .383 | .375 | .994 | .799 |
| 9 | .571 | .378 | .571 | .378 | .383 | .378 | 1.004 | .848 |
| 10 | .594 | .339 | .594 | .339 | .382 | .339 | .909 | .895 |
| 11 | .587 | .310 | .587 | .310 | .400 | .310 | .794 | .806 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 9.4 | 3.6 | 15.0 | .537 | .000 | .142 | .142 | .055 | .055 |
| 2 | 10.00 | 9.8 | 4.0 | 14.9 | .525 | .000 | .139 | .139 | .053 | .053 |
| 3 | 20.00 | 11.7 | 6.0 | 12.8 | .540 | .000 | .118 | .118 | .044 | .044 |
| 4 | 30.00 | 10.4 | 4.7 | 10.7 | .537 | .000 | .109 | .109 | .038 | .038 |
| 5 | 36.00 | 8.8 | 3.2 | 10.0 | .534 | .000 | .093 | .093 | .032 | .032 |
| 6 | 42.00 | 6.6 | 1.0 | 9.2 | .524 | .000 | .077 | .077 | .026 | .026 |
| 7 | 50.00 | 5.7 | .2 | 8.8 | .521 | .000 | .062 | .062 | .020 | .020 |
| 8 | 70.00 | 6.5 | 1.2 | 9.1 | .520 | .000 | .064 | .064 | .019 | .019 |
| 9 | 80.00 | 6.2 | 1.0 | 11.6 | .532 | .000 | .089 | .089 | .025 | .025 |
| 10 | 90.00 | 4.7 | -.4 | 13.5 | .619 | .000 | .172 | .172 | .046 | .046 |
| 11 | 95.00 | -.7 | -5.7 | 13.9 | .651 | .000 | .184 | .184 | .048 | .048 |

TABLE IX. - Concluded. BLADE-ELEMENT DATA AT BLADE EDGES

FOR SECOND-STAGE STATOR

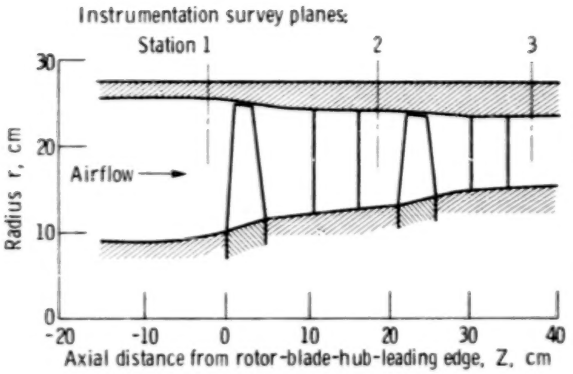
(h) 80 Percent of design speed; reading 183

| RP | RADII IN | RADII OUT | ABS BETAM IN | ABS BETAM OUT | REL BETAM IN | REL BETAM OUT | TOTAL TEMP IN | TOTAL TEMP RATIO | TOTAL PRESS IN | TOTAL PRESS RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 23.109 | 23.129 | 39.8 | .0 | 39.8 | .0 | 359.6 | 1.000 | 18.09 | .980 |
| 2 | 22.647 | 22.685 | 40.7 | 2.5 | 40.7 | 2.5 | 358.7 | 1.000 | 18.15 | .985 |
| 3 | 21.727 | 21.801 | 40.7 | 1.6 | 40.7 | 1.6 | 355.9 | 1.000 | 18.11 | .988 |
| 4 | 20.823 | 20.922 | 40.7 | .4 | 40.7 | .4 | 353.9 | 1.000 | 18.12 | .987 |
| 5 | 20.287 | 20.401 | 40.8 | .0 | 40.8 | .0 | 353.3 | 1.000 | 18.09 | .989 |
| 6 | 19.756 | 19.883 | 40.2 | -.5 | 40.2 | -.5 | 352.6 | 1.000 | 18.08 | .988 |
| 7 | 19.060 | 19.205 | 40.6 | -1.0 | 40.6 | -1.0 | 351.6 | 1.000 | 18.03 | .991 |
| 8 | 17.369 | 17.567 | 43.0 | -2.1 | 43.0 | -2.1 | 349.4 | 1.000 | 18.22 | .991 |
| 9 | 16.548 | 16.787 | 45.3 | -.1 | 45.3 | -.1 | 350.0 | 1.000 | 18.45 | .986 |
| 10 | 15.740 | 16.040 | 48.3 | .5 | 48.3 | .5 | 351.1 | 1.000 | 18.47 | .961 |
| 11 | 15.339 | 15.682 | 46.0 | -.8 | 46.0 | -.8 | 351.5 | 1.000 | 18.17 | .959 |

| RP | ABS VEL IN | ABS VEL OUT | REL VEL IN | REL VEL OUT | MERID VEL IN | MERID VEL OUT | TANG VEL IN | TANG VEL OUT | WHEEL SPEED IN | WHEEL SPEED OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 175.7 | 129.6 | 175.7 | 129.6 | 135.0 | 129.6 | 112.5 | .1 | .0 | .0 |
| 2 | 178.4 | 135.2 | 178.4 | 135.2 | 135.2 | 135.1 | 116.3 | 5.9 | .0 | .0 |
| 3 | 180.2 | 137.6 | 180.2 | 137.6 | 136.7 | 137.6 | 117.4 | 3.8 | .0 | .0 |
| 4 | 182.1 | 137.4 | 182.1 | 137.4 | 138.0 | 137.4 | 118.8 | 1.0 | .0 | .0 |
| 5 | 183.4 | 137.4 | 183.4 | 137.4 | 138.9 | 137.4 | 119.8 | .0 | .0 | .0 |
| 6 | 184.3 | 136.8 | 184.3 | 136.8 | 140.8 | 136.8 | 118.9 | -1.2 | .0 | .0 |
| 7 | 186.4 | 137.2 | 186.4 | 137.2 | 141.5 | 137.1 | 121.3 | -2.3 | .0 | .0 |
| 8 | 199.2 | 149.0 | 199.2 | 149.0 | 145.7 | 148.9 | 135.8 | -5.4 | .0 | .0 |
| 9 | 208.5 | 152.7 | 208.5 | 152.7 | 146.6 | 152.7 | 148.2 | -.2 | .0 | .0 |
| 10 | 218.4 | 140.8 | 218.4 | 140.8 | 145.3 | 140.8 | 163.0 | 1.2 | .0 | .0 |
| 11 | 213.9 | 127.3 | 213.9 | 127.3 | 148.6 | 127.3 | 153.9 | -1.8 | .0 | .0 |

| RP | ABS MACH NO IN | ABS MACH NO OUT | REL MACH NO IN | REL MACH NO OUT | MERID MACH NO IN | MERID MACH NO OUT | MERID PEAK SS VEL R | MERID PEAK SS MACH NO |
|---|---|---|---|---|---|---|---|---|
| 1 | .473 | .345 | .473 | .345 | .363 | .345 | .960 | .672 |
| 2 | .481 | .361 | .481 | .361 | .365 | .361 | .999 | .691 |
| 3 | .488 | .369 | .488 | .369 | .370 | .369 | 1.007 | .689 |
| 4 | .495 | .370 | .495 | .370 | .375 | .370 | .996 | .690 |
| 5 | .499 | .370 | .499 | .370 | .378 | .370 | .989 | .691 |
| 6 | .502 | .368 | .502 | .368 | .384 | .368 | .971 | .677 |
| 7 | .509 | .370 | .509 | .370 | .386 | .370 | .969 | .683 |
| 8 | .548 | .404 | .548 | .404 | .401 | .404 | 1.022 | .745 |
| 9 | .574 | .414 | .574 | .414 | .404 | .414 | 1.042 | .802 |
| 10 | .602 | .381 | .602 | .381 | .401 | .381 | .969 | .871 |
| 11 | .589 | .343 | .589 | .343 | .409 | .343 | .857 | .788 |

| RP | PERCENT SPAN | INCIDENCE MEAN | INCIDENCE SS | DEV | D-FACT | EFF | LOSS COEFF TOT | LOSS COEFF PROF | LOSS PARAM TOT | LOSS PARAM PROF |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.00 | 4.3 | -1.4 | 14.6 | .512 | .000 | .141 | .141 | .055 | .055 |
| 2 | 10.00 | 5.5 | -.3 | 15.5 | .479 | .000 | .104 | .104 | .040 | .040 |
| 3 | 20.00 | 5.7 | -.0 | 12.5 | .468 | .000 | .081 | .081 | .030 | .030 |
| 4 | 30.00 | 5.8 | .1 | 10.5 | .473 | .000 | .082 | .082 | .029 | .029 |
| 5 | 36.00 | 5.6 | -.0 | 9.8 | .475 | .000 | .068 | .068 | .023 | .023 |
| 6 | 42.00 | 4.4 | -1.1 | 9.2 | .475 | .000 | .074 | .074 | .025 | .025 |
| 7 | 50.00 | 4.1 | -1.4 | 8.7 | .478 | .000 | .053 | .053 | .017 | .017 |
| 8 | 70.00 | 3.7 | -1.6 | 8.0 | .460 | .000 | .051 | .051 | .015 | .015 |
| 9 | 80.00 | 3.6 | -1.6 | 10.9 | .466 | .000 | .071 | .071 | .020 | .020 |
| 10 | 90.00 | 2.9 | -2.2 | 13.8 | .552 | .000 | .178 | .178 | .048 | .048 |
| 11 | 95.00 | -1.7 | -6.7 | 14.4 | .593 | .000 | .198 | .198 | .052 | .052 |

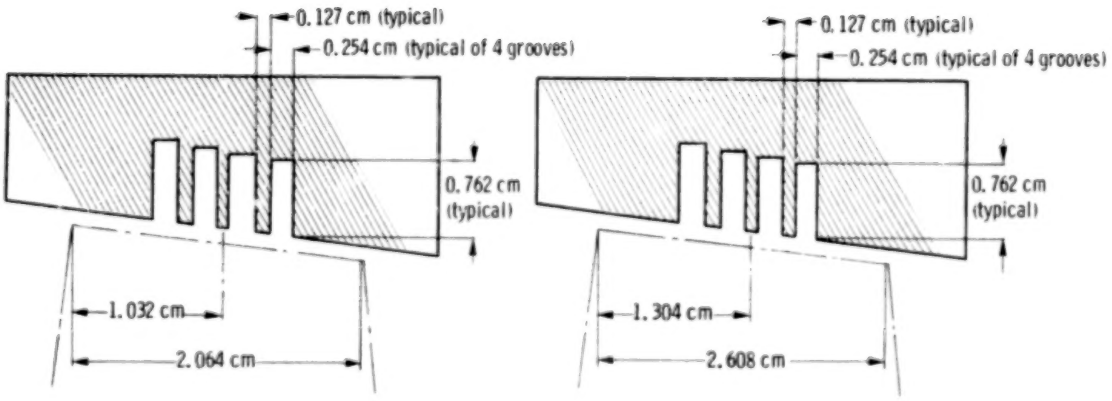



Flow path coordinates

| Axial distance Z, cm | Radius r, cm | |
|---|---|---|
| | Outer | Inner |
| -15.237 | 25.654 | 8.994 |
| -10.160 | 25.654 | 8.903 |
| -5.080 | 25.654 | 9.093 |
| [a]-2.347 | 25.651 | 9.543 |
| 0 | 25.570 | 10.160 |
| 2.540 | 25.128 | 10.973 |
| 5.080 | 24.681 | 11.565 |
| 7.620 | 24.460 | 11.902 |
| 10.160 | 24.384 | 12.139 |
| 12.700 | | 12.438 |
| 15.240 | | 12.822 |
| 17.780 | | 13.025 |
| [a]18.659 | | 13.038 |
| 20.320 | 24.328 | 13.152 |
| 22.860 | 23.993 | 13.627 |
| 25.400 | 23.655 | 14.371 |
| 27.940 | 23.622 | 14.699 |
| 30.033 | | 14.849 |
| 34.610 | | 15.237 |
| [a]36.706 | | 15.240 |
| 40.640 | | 15.240 |

[a]Instrumentation survey plane

Figure 1. - Two-stage fan flow path.




(a) Rotor one.

(b) Rotor two.

Figure 2. - Circumferentially grooved casing treatment.

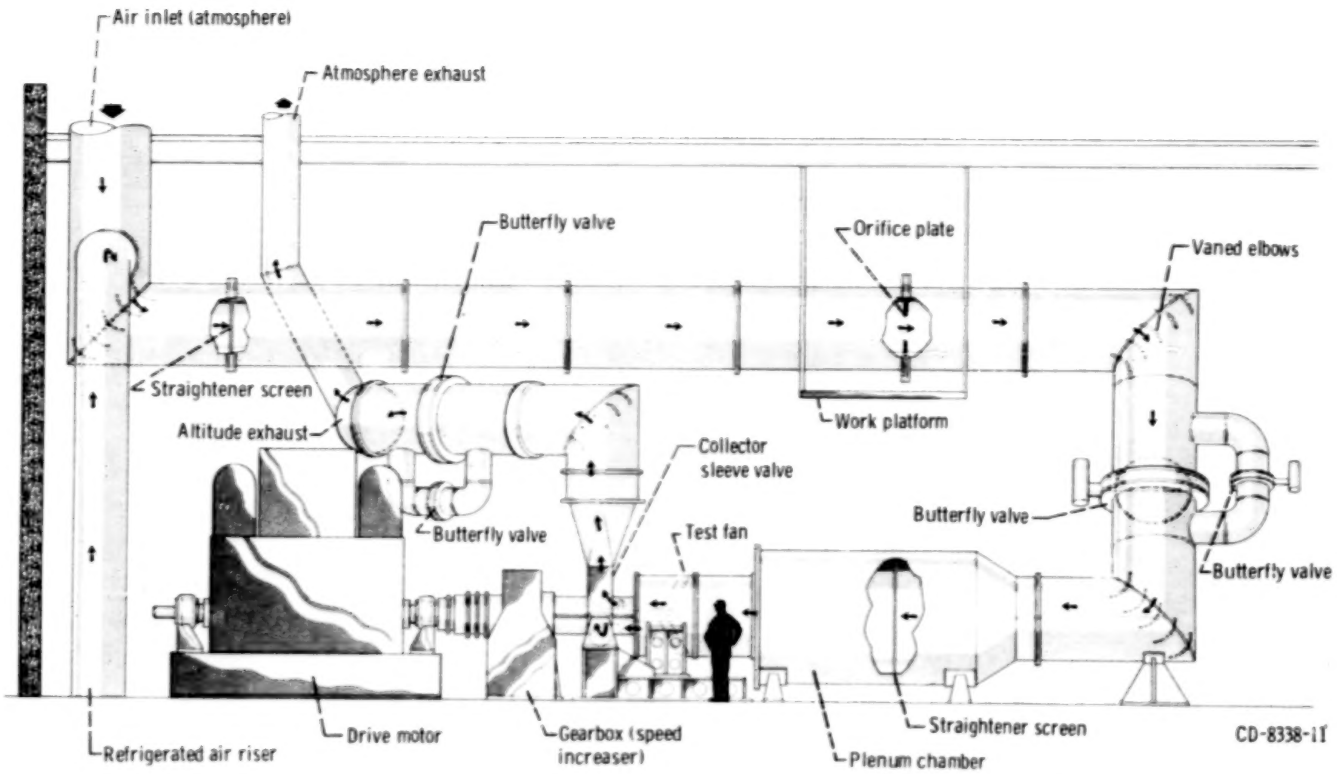



Figure 3. - Multistage compressor test facility.

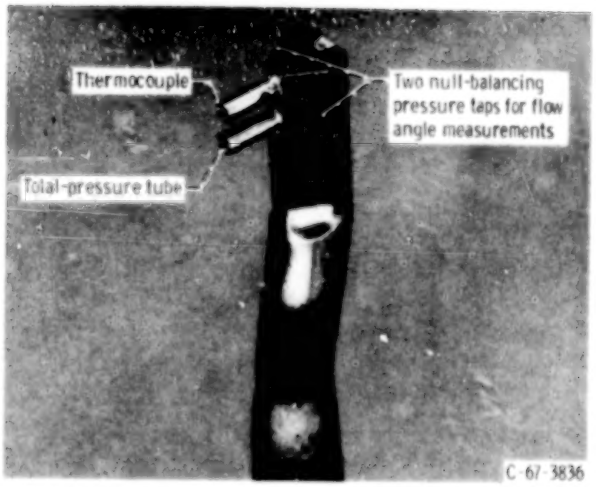



Figure 4. - Combination total-pressure, total-temperature, and flow-angle probe (double barrel).

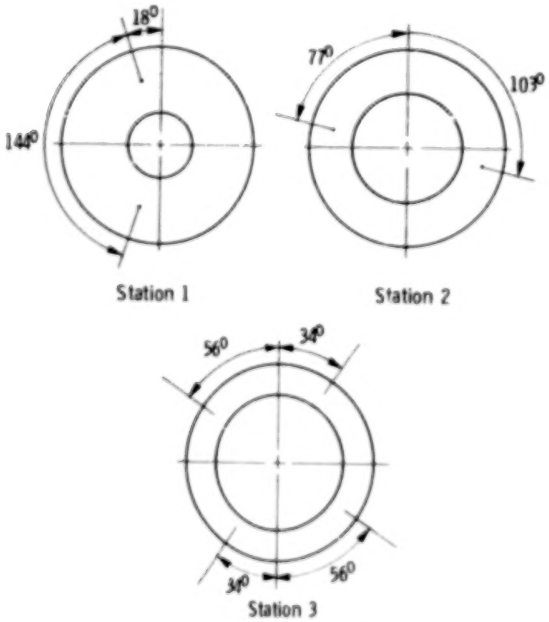
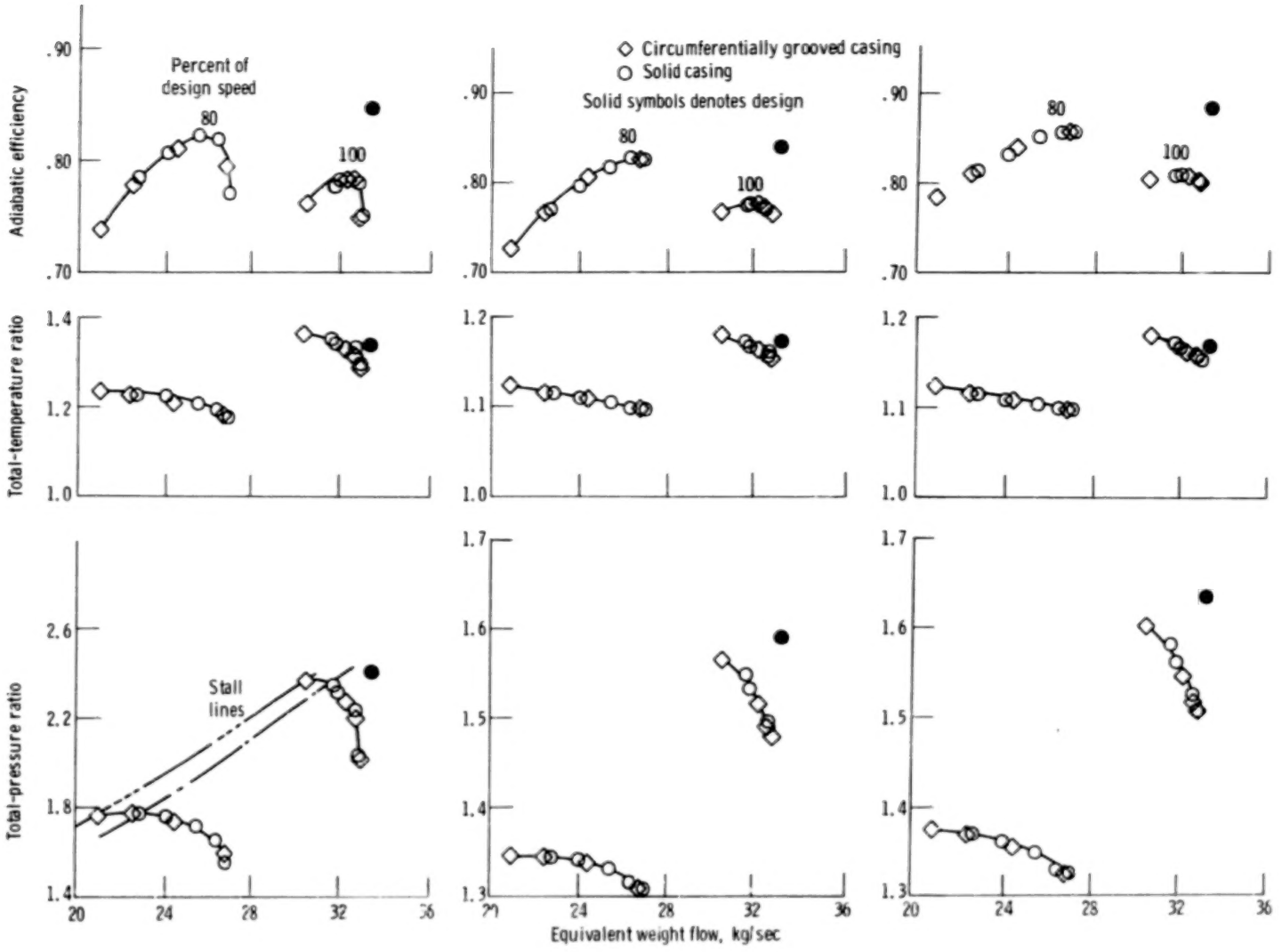



Figure 5. - Circumferential locations of combination probes (looking downstream; clockwise rotation).




(a) Two-stage fan.

(b) First-stage fan.

(c) First-stage rotor.

Figure 6. - Overall performance with and without casing treatment.

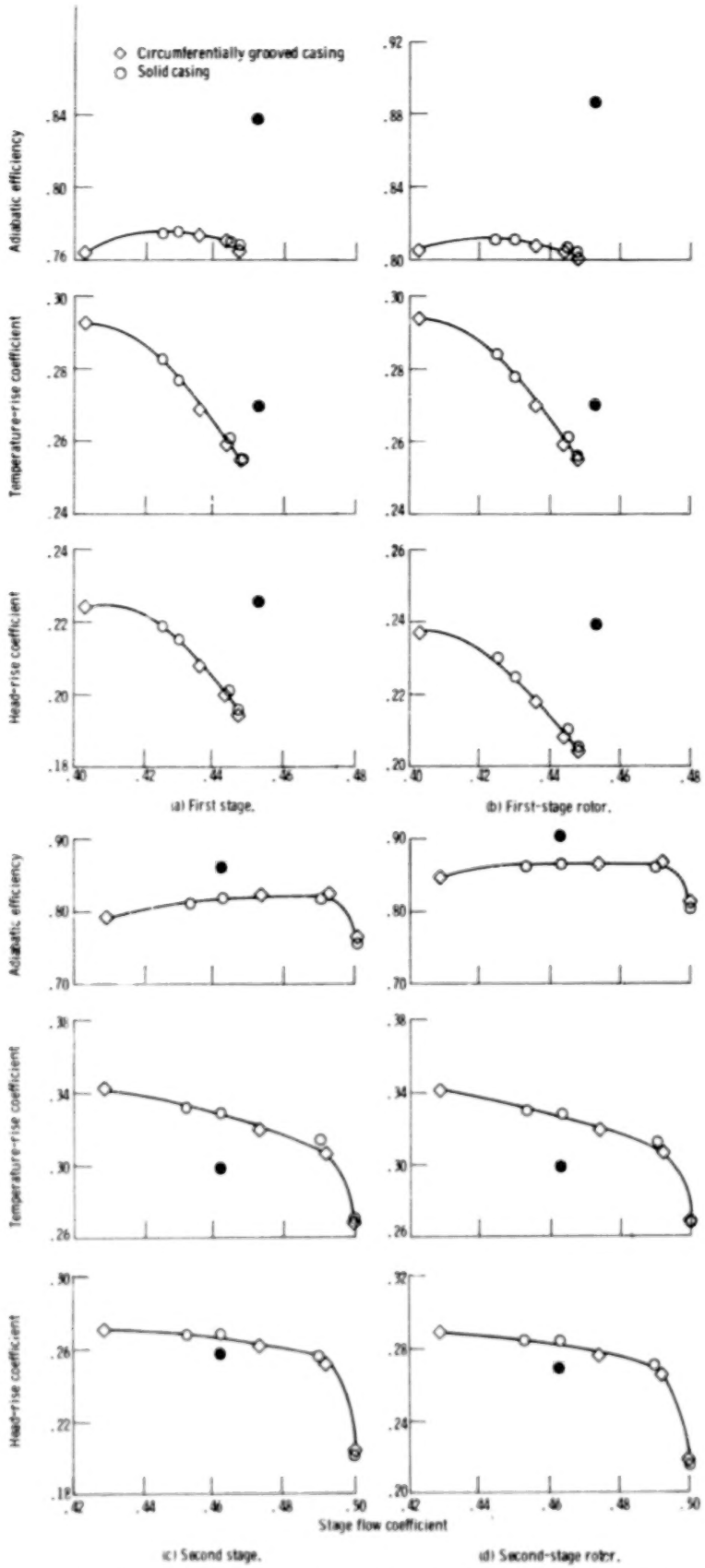
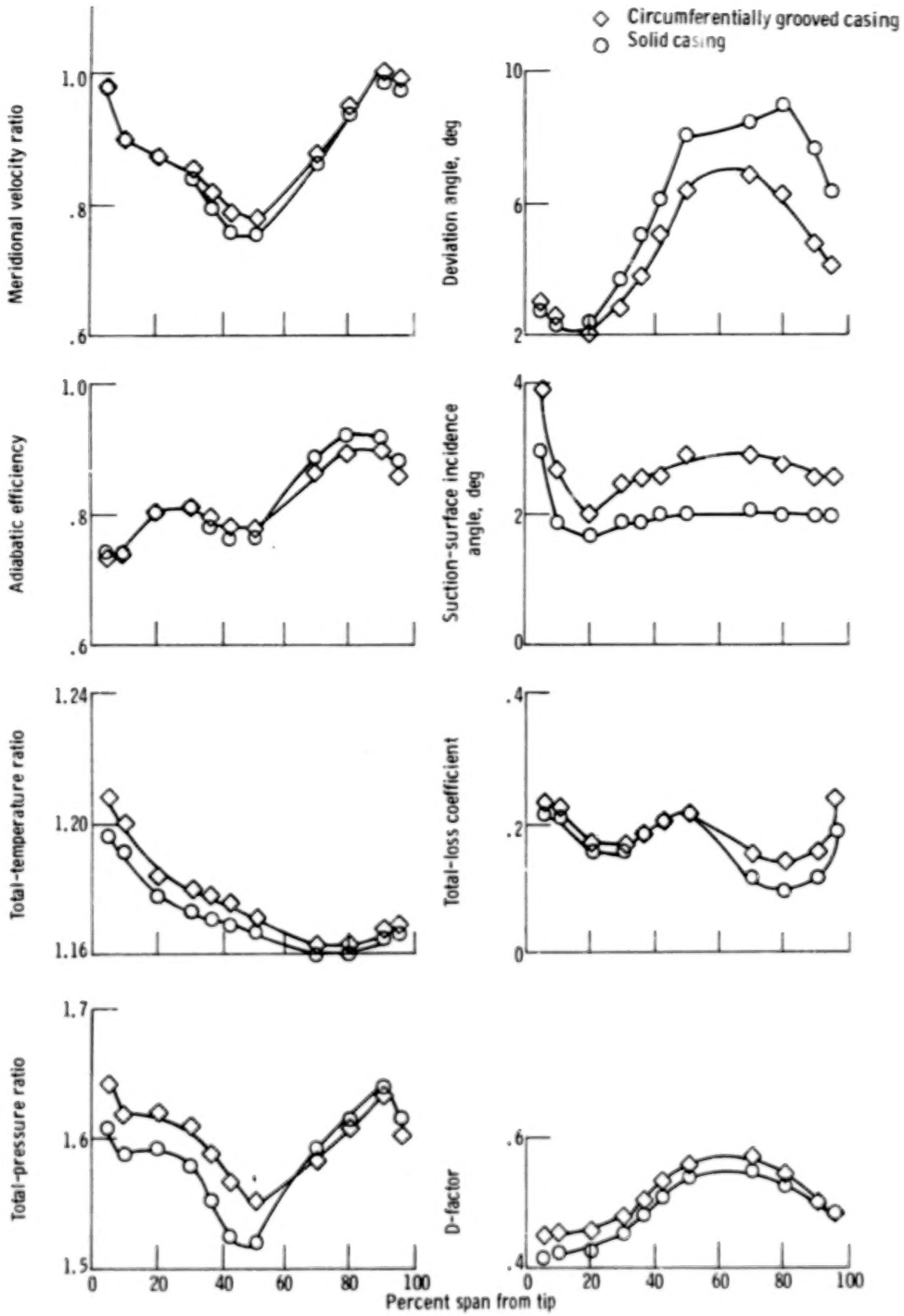
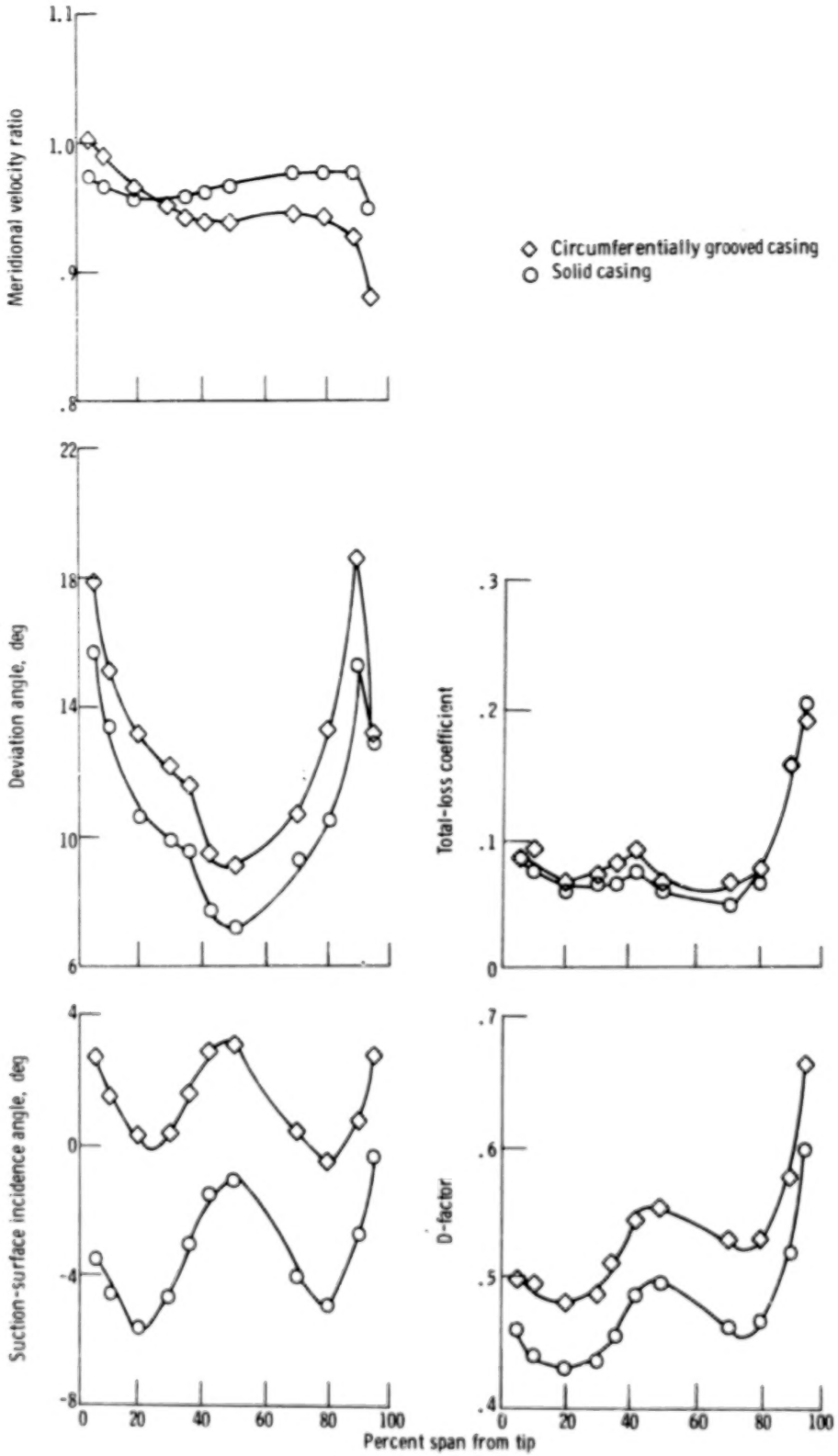



Figure 7. - Nondimensional overall performance at design speed with and without casing treatment.



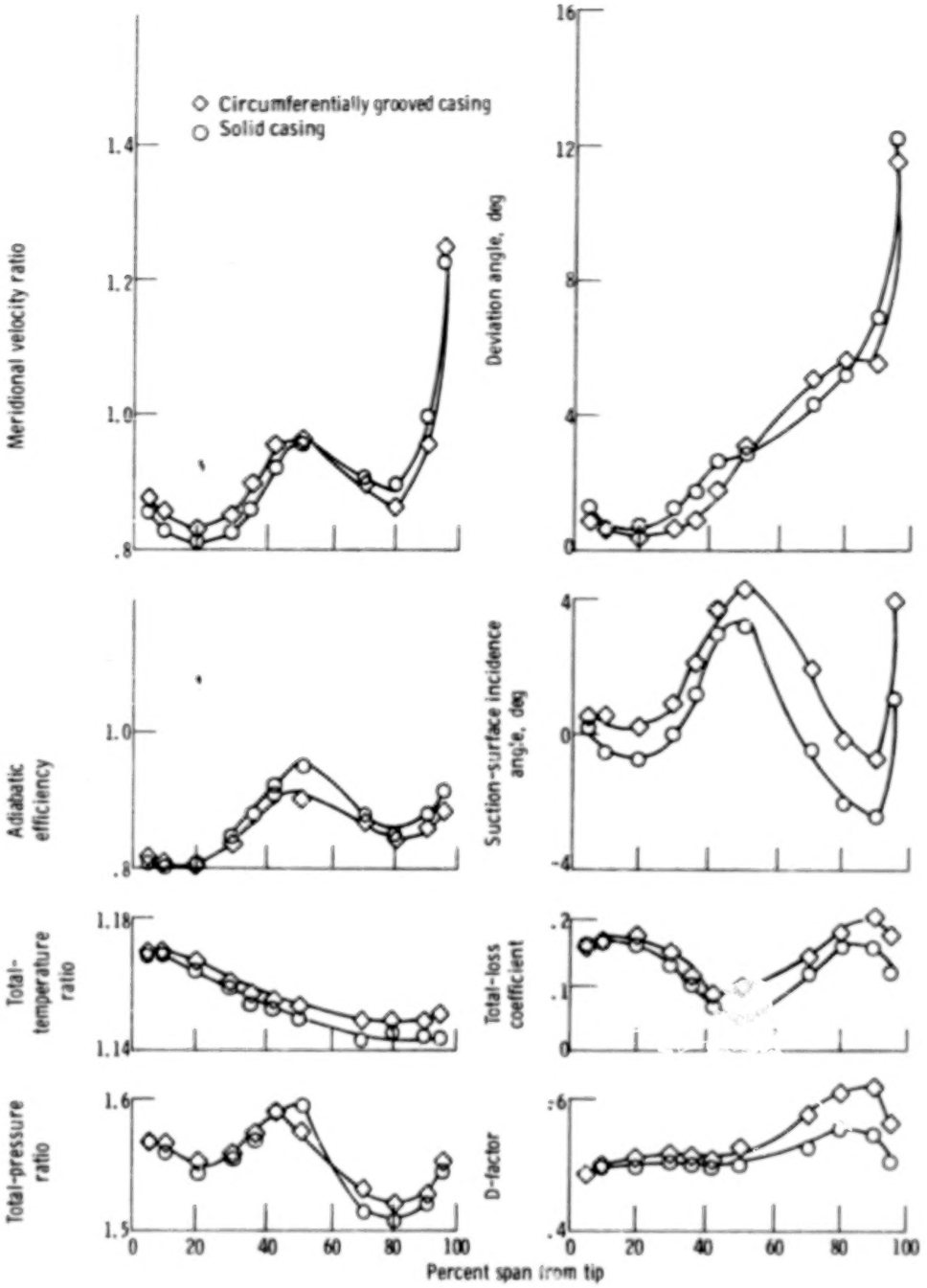

(a) First-stage rotor.

Figure 8. - Radial distributions of performance parameters with and without casing treatment at stall weight flows.



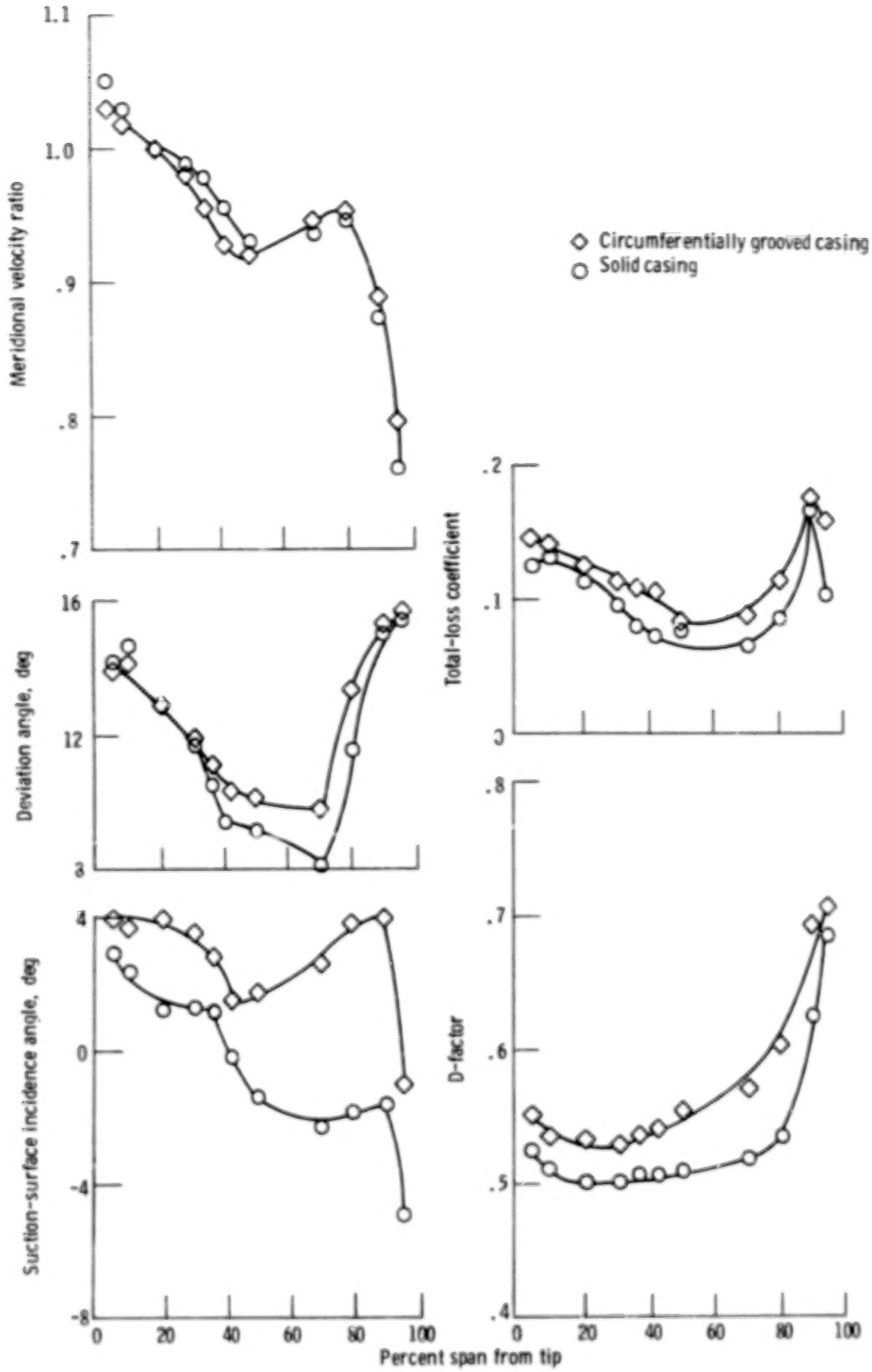

(b) First-stage stator.

Figure 8. - Continued.




(c) Second-stage rotor.

Figure 8. - Continued.




(d) Second-stage stator.

Figure 8. - Concluded.

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|---|---|---|
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15. Supplementary Notes

16. Abstract

A two-stage fan, previously tested with a solid casing, was tested with a casing with circumferential grooves over the tips of both rotors (casing treatment). Tests were conducted at 80 and 100 percent of design speed with uniform flow. The casing treatment improved the flow range and stall margin significantly without changing the characteristic overall performance curves of total-pressure and efficiency as functions of weight flow, other than extending them to lower weight flows.

| 17. Key Words (Suggested by Author(s)) | 18. Distribution Statement |
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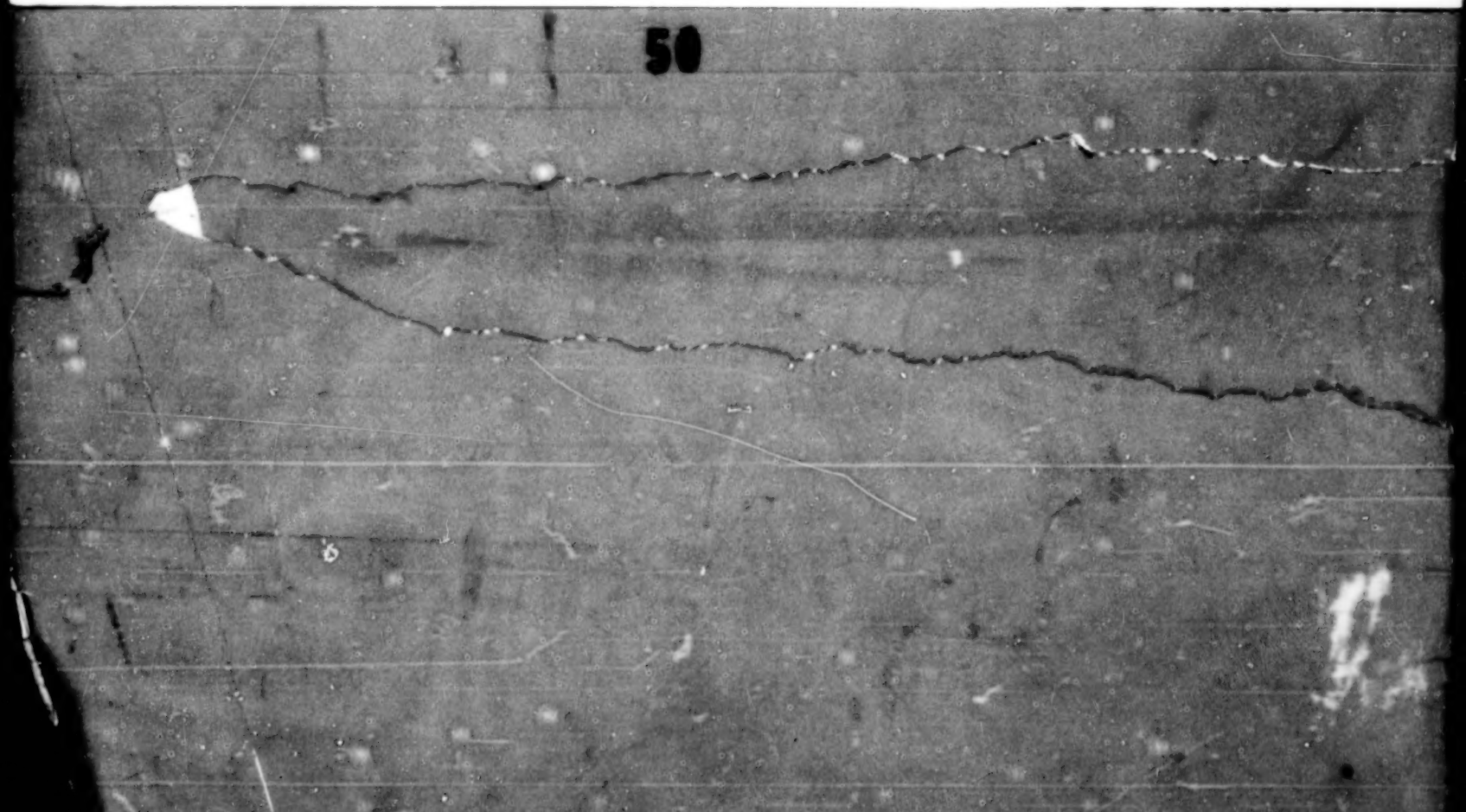
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# END

June 27, 1979